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Government of
Saskatchewan

Annual Report
1986-87

Saskatchewan
Energy and Mines

for the fiscal year ending
March 31, 1987

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Letters of Transmittal

The Honourable Frederick William Johnson
Lieutenant-Governor
Province of Saskatchewan

Dear Sir:

I have the honour to submit herewith the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1987.

Respectfully Submitted,

Honourable Patricia Smith
Minister of Energy and Mines

Letters of Transmittal

The Honourable Patricia Smith
Minister of Energy and Mines
Province of Saskatchewan

Dear Madam:

I have the honour to submit, for your consideration the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1987.

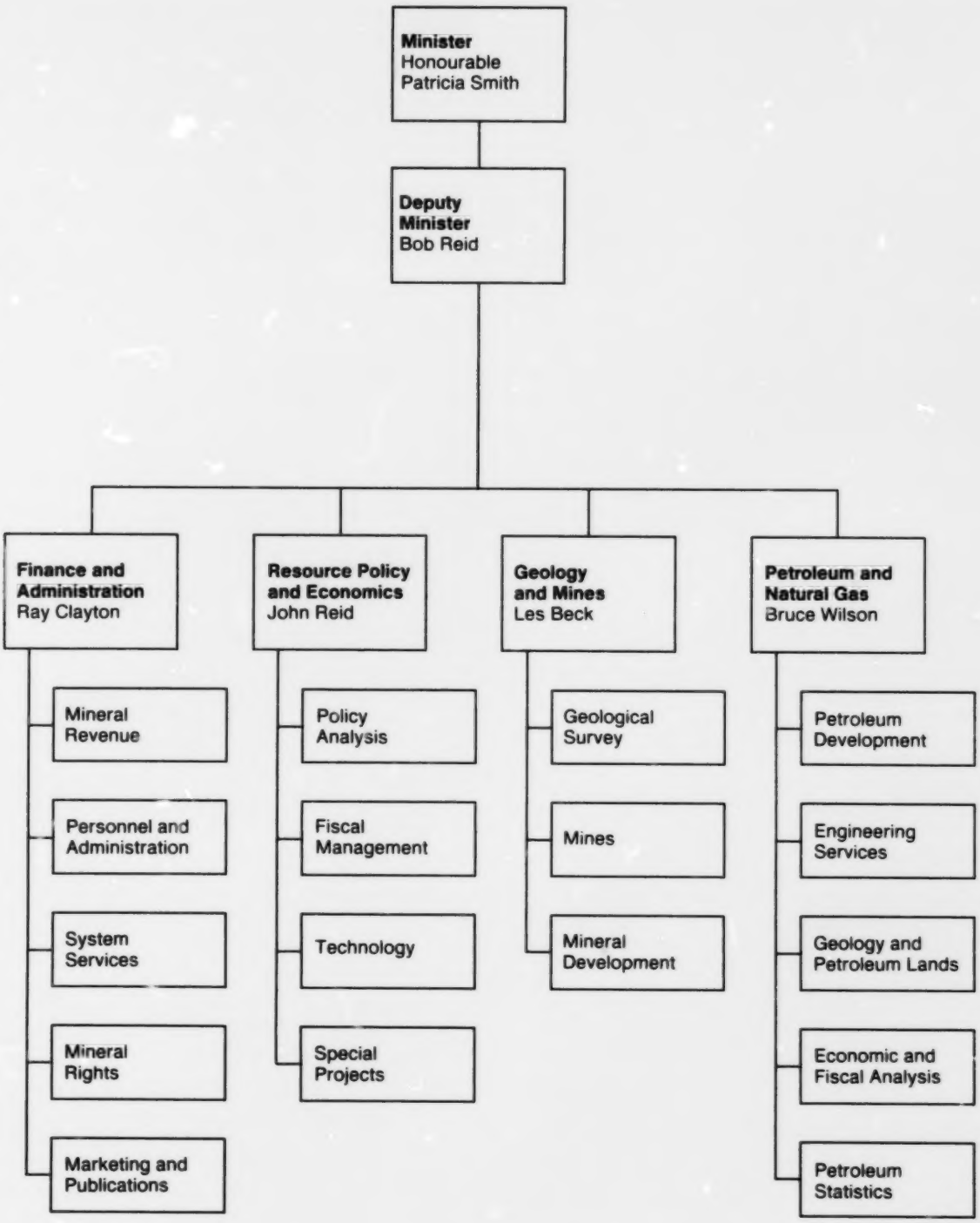
At this time I want to recognize Saskatchewan Energy and Mines staff members for maintaining the department's traditional high standard of performance while responding with versatility to new demands.

Respectfully Submitted,

Bob Reid

Bob Reid
Deputy Minister
Saskatchewan Energy and Mines

Organization Chart



Finance and Administration Division

Ray Clayton
Assistant Deputy Minister

The Finance and Administration Division is responsible for mineral revenue collection and audits, internal administration and personnel, legislative co-ordination, communication, mineral rights, system services, marketing and publications.

The Finance and Administration Division is composed of five branches:

- Mineral Revenue
- Administrative Services
- Mineral Rights
- System Services
- Marketing and Publications

Mineral Revenue Branch

The Mineral Revenue Branch is responsible for collecting, recording and accounting for the various resource revenues owing to the province. The branch:

- ensures that revenues and accompanying returns and reports are received when due;
- assesses certain kinds of resource revenues on an annual or periodic basis;
- assesses interest and/or penalties on late payments and overdue returns;
- processes revenues through computer and manual systems, as input to financial and management information reports;
- audits resource companies to ensure compliance with taxation legislation;
- maintains historical records of all resource revenues received by the department;
- prepares special reports for use by department officials;
- informs the resource industry of its responsibilities under existing legislation and changes thereto; and
- maintains close liaison with other branches of the department on revenue matters.

This branch is divided into two sections; revenue processing and revenue monitoring. Revenue processing is responsible for maintenance of the taxroll; receiving and recording of revenue; verification and processing of revenue returns; billing of various royalties, rentals and taxes; taxpayer information and assistance relating to resource taxation legislation, requirements and procedures; maintenance of computer systems and their interface with other department and government systems; and processing and payment of incentive grants, compensation payments and payments to holders of trust certificates.

Revenue monitoring is responsible for office and field audits in all resource revenue areas, follow up of delinquent returns, collection of accounts receivable and informing taxpayers of resource taxation legislation.

The main objectives of the branch are to ensure that resource revenues owing to the province are received when due, that the amounts paid are correct and properly accounted for, and that data is available on a regular and accurate basis for preparation of financial reports. To attain these objectives, the branch is committed to a continuous program of review and improvement to existing systems and procedures, or to the development of new systems.

Other objectives include continued and improved communication with taxpayers and the resource industry, greater involvement in policy decisions affecting resource revenues, and training and upgrading of staff to improve the branch's efficiency.

Legislation

The Mineral Revenue Branch administers the revenue provisions of numerous acts, regulations and agreements. Among the more significant are:

The Mineral Resources Act, 1985
- The Petroleum and Natural Gas Regulations, 1969
- The Oil and Gas Incentive Regulations
- The Mineral Dispositions Regulations, 1986 including Uranium Royalties
- The Delayed Payment Charges Regulations, 1970

The Oil Well Income Tax Act and Regulations

The Freehold Oil and Gas Production Tax Act and Regulations

The Mineral Taxation Act, 1983
- The Freehold Coal Production Tax Regulations
- Regulations pertaining to Mineral Rights Tax

The Crown Minerals Acts, 1985

The Potash Resource Payment Agreement

Revenues

A decrease of 60 per cent in total resource revenues was experienced during this fiscal year. Total revenue during 1986-87 amounted to $311.1 million, a decrease of $463.3 million over 1985-86.

Source of Revenue	1986-87	1985-86	Per cent Increase (Per cent Decrease)
Heritage Fund			
Oil and Gas	$234,812,562	$687,268,742	(65.8)
Potash	36,982,151	32,592,497	13.5
Uranium	17,807,026	36,269,443	(50.9)
Other Minerals	15,405,157	12,856,237	19.8
Total	$305,006,896	$768,986,919	

Consolidated Fund			
Mineral Land Tax	$ 3,366,993	$ 3,353,370	.4
Interest and Penalty	2,416	4,897	(50.7)
Sales, Services, etc.	276,030	282,392	(2.3)
Receipts from other Governments	2,490,746	1,814,307	37.3
Total	$ 6,136,185	$ 5,454,966	

Incentives and Compensations

Payments under The Oil and Gas Incentive Regulations were suspended for 1986-87. Compensation payments to former mineral owners were $2.3 million in 1986-87 compared to $2.6 million paid in 1985-86.

Certain mineral rights surrendered to the Crown were encumbered by gross royalty trust certificates. As these lands are leased and brought into production, the branch pays the applicable gross overriding royalty. Payments in 1986-87 totalled $133,358 compared to $230,992 in 1985-86.

Number of Accounts	Type Account	Reporting Frequency
500	Operator Statements	Month
124	Net Royalties	Month
10,000	P & NG Lease Rentals	Annual
50	Mineral Lease	Month
40	Compensatory Royalties	Month
25	Potash	Month/Quarter/ Annual
45	Uranium and Sodium Sulphate	Month/Quarter/ Annual
800	Coal	Month/Quarter/ Annual
500	Quarrying	Month/Quarter/ Annual
70	Salt and Other Minerals	Month/Quarter/ Annual
1,180	Mineral Rights Tax	Annual
110	Miscellaneous Sales	Month

Personnel and Administration Branch

The objective of this branch is to facilitate the delivery of department programs by providing a variety of personnel and administrative services to department staff. Specific areas of responsibility include:

- **Human resource management**
  - planning, organizing and implementing personnel activities related to the recruitment and selection of staff, classification, staff development, employee relations, administration of government policies and the processing of all personnel transactions.
- **Financial management**
  - assisting in the development of a department budget strategy and managing the processing of all financial transactions, preparation of financial statements, forecasting of expenditures and budget control. Specific processing activities are handled on a daily basis by the accounts group.
- **Property and Procurement Control**
  - Through the purchasing section, all equipment, furniture and supplies are purchased and delivered, a central stockroom is maintained, office space is acquired or changed and physical moves are undertaken. Other activities include: acquisition and control of equipment and supplies, print procurement, and rental of photocopiers.
- **Drafting Section**

  Early in 1986, this section was transferred to the Geology and Mines Division.
- **Special Projects**

  A number of new activities were undertaken during the year under review:
  - development and implementation of a work planning and review program for all staff. Employees attended four day workshops to enhance their communication skills in order to facilitate discussions about their work plans with other employees.
  - development of a department employment equity plan
  - enhancement of an in-house seminar program
  - completion of a department zero base budget review

System Services Branch

System Services provides planning, management, consulting and co-ordination support functions for the development of new and the maintenance and operation of existing information systems for the department. This includes responsibility for the evaluation and acquisition of computer hardware and software, data-entry, data security, word processing co-ordination and support and the development and management of the department's computer services budget.

System analysis, development and maintenance are performed by branch staff or co-ordinated with consultant services. The department currently runs eighteen computer systems on a regular production basis.

The automated systems use a variety of equipment and computers. The branch operates a remote job entry terminal that provides the communications link between the department and SaskCOMP computers. In addition, on-line terminals and micro

computers are available for on-line data processing, program development and maintenance.

The following major projects were initiated:

- Preparation of a Department Strategic Technology Plan
- Implementation of a Gas Deregulation System
- Development of a system to Standardized Oil and Gas Production Accounting with Alberta and British Columbia.
- Implementation of an AutoCAD system for plotting Well Location Maps

Mineral Rights Branch

The Mineral Rights Branch is concerned with mineral land ownership and records. Comprised of three sections, its responsibilities are outlined as follows:

Mineral Land Ownership Section

This section:

- maintains a computerized freehold mineral land ownership base for all taxable parcels of mineral lands that are assessed a mineral rights tax;
- prepares and registers all mineral land transfers to the Crown;
- enforces foreclosures under The Mineral Taxation Act;
- interprets and verifies mineral land ownership for various branches of the department and for industry.
- provides historical reviews and data necessary for any legal cases regarding doubtful mineral ownership when the department is involved;
- registers and withdraws caveats that affect Crown mineral lands; and
- registers and discharges builders' liens filed against Crown mineral land dispositions under The Builders' Lien Act.

Mineral Land Records Section

This section:

- maintains a mineral land record of all Crown and freehold mineral ownership, which includes an up-to-date record of all Crown mineral land dispositions in the surveyed area of the province;
- maintains a record of all Crown mineral lands held subject to various trust agreements. This includes the registration of transfers of the trust certificates and the availability for land disposition sales;
- verifies Crown mineral lands available for Crown mineral land disposition sales;
- computes acreage figures for all Crown mineral land dispositions;
- supplies industry upon request, information regarding the disposition or availability of Crown mineral lands; and
- verifies mineral land ownership for every well that is licensed.

Landfile Section

This section:

- maintains an up-to-date computerized landfile with data identifying all completed, producing and expired oil and gas wells in the province. Ownership of each well is identified and the data is used in the collection of oil and gas revenues; and
- verifies new ownership of mineral lands that relate to producing properties.

Summary of Activities

The following table indicates the number of transfers completed during the year under review.

Land Registration District	Transfers	Acreage
Humboldt	404	166,663
Yorkton	224	83,409
Moose Jaw	82	36,158
Total	710	286,230

Builders' Liens

During the fiscal year 337 liens were registered and 110 discharges were recorded under The Builders' Lien Act.

Caveats

Thirty-six caveats were placed against delinquent taxpayers' titles and seven caveats were withdrawn in compliance with The Mineral Taxation Act. The following table indicates the number and acreage of forfeitures completed during the year under review.

Land Registration District	Forfeiture	Acreage
Moose Jaw	3	800
Saskatoon	5	1,283
Humboldt	3	808
Total	11	2,891

Marketing and Publications Branch

The Marketing and Publications Branch is responsible for the printing of technical materials and for the promotion, sale and distribution of these materials to the resource industry. Displays at major trade shows and the placement of advertisements in select trade journals have contributed to sales totalling $234,392.32 in 1986-87.

A resource library for use of staff and industry clients is also maintained by this branch. The branch also provides a daily newspaper clipping service for the minister and senior management.

In addition, this branch is responsible for the preparation of general and educational information on Saskatchewan resources, for distribution to the general public and for the use of teachers and students.

Resource Policy and Economics Division

John Reid
Assistant Deputy Minister

The Resource Policy and Economics Division was expanded in 1986-87 with the transfer of the Special Projects Branch from the Deputy Minister's office. In addition to continuing to co-ordinate government participation in major energy projects such as the NewGrade Upgrader in Regina, the scope of the Special Projects Branch was broadened to encompass responsibility for international trade issues. By the end of the 1986-87 fiscal year, trade matters had become a major concern of the division as many of the province's key energy and mineral commodities were subject to or threatened by initiatives which could limit provincial exports, including potash, uranium, natural gas, petroleum and coal.

The Resource Policy and Economics Division conducts research and analysis of policy issues related to energy and mineral resource development. Information and recommendations are provided to government to assist in the formulation of policies respecting such matters as: deregulation of natural gas markets and prices; developments affecting international and interprovincial trade; the rate of development of the province's energy and mineral resources; the pricing and taxation of resources; market development; research, development and demonstration activities; and nonconventional and renewable energy resources. The division also carries out negotiations with the federal government and other provincial governments on issues of mutual concern in the mineral and energy sectors.

Specific objectives of the Resource Policy and Economics Division are to:

- monitor and analyse the resource markets, industry structure and performance, and comparative fiscal systems to provide informed assessments for senior management;
- anticipate emerging issues and assist in the development of appropriate policies, strategies and fiscal instruments with which the department can meet its mandate;
- analyse departmental policies and fiscal instruments to ensure that they remain appropriate and effective in meeting the department's mandate.
- negotiate major federal/provincial fiscal issues and arrangements regarding energy and mineral resources;
- develop and manage royalty and taxation systems in relation to the mineral resources of the province (in order to maintain a balance between a fair economic return to the province and incentives to industry);
- produce timely and accurate forecasts of capital investment, production, royalty revenue and employment in mineral industries;
- develop policies and strategies to promote technologies that will lead to more cost-effective and efficient recovery and utilization of our energy resources;
- design and deliver appropriate research, development and demonstration funding programs; and
- maintain an awareness of, and advise the government on technology issues, problems and opportunities within the energy sector.

Policy Analysis Branch

The four main functions of this branch are to:

- monitor and assess changes in the external policy and market environment in which industry operates;
- co-ordinate the department's economic and revenue forecasts;
- conduct economic and financial evaluations of projects and policies relating to the production, processing, distribution, marketing, pricing and taxation of the mineral and energy sectors;
- develop and recommend policy and strategic options and instruments for the mineral and energy sectors; and
- participate in federal/provincial negotiations on issues of joint interest in the mineral and energy sectors.

To fulfill these responsibilities, the professional backgrounds of personnel in the branch encompass a broad range of skills necessary for the evaluation, co-ordination and/or initiation of issues or policies. Close liaison with both industry and other branches of the department ensure that policies developed are timely, effective and sustainable.

Oil

The primary oil-related activities of the branch in 1986-87 centred around policy initiatives required in reaction to the drop in world oil prices These initiatives were developed in conjunction with the Petroleum and Natural Gas Division. Specifically:

- The Saskatchewan Oilfield Employment Program reduced royalty rates for a three month period beginning May 1, 1986, and provided royalty and tax credits for forty per cent of specified workover costs.
- This program was judged to have fulfilled the goals of maintaining wells on production and minimizing employment losses during the initial period of low prices, and was therefore extended for a further three months to October 31, 1986.
- A permanent price-sensitive royalty system was introduced beginning January 1, 1987. Royalty rates now automatically adjust to changes in oil prices. As well, the highly successful royalty holidays were extended to encourage further drilling and thereby further employment, production and royalty revenue.

In addition to these key policy initiatives, the Policy Analysis Branch was active in the evaluation of relief programs proposed by various industry

associations, and discussions with the federal and other provincial governments.

At the international level, the fall in oil prices and subsequent increase in demand for oil and decrease in exploration activity will result in a renewed reliance on OPEC oil supplies. The provincial and federal governments have begun a national review of energy security issues. Over the long term Saskatchewan can make a major contribution to domestic oil supplies by the development and upgrading of our massive heavy oil reserves. The Policy Analysis Branch has been involved in preparing Saskatchewan's contribution to the energy security review.

Other specific policy concerns of significant interest to Saskatchewan were addressed in 1986-87, including:

- American tax reform and the continued threat of oil import fees in the U.S.A.;
- world oil price stability and OPEC's return to official prices;
- federal-provincial revenue sharing agreements and their impact on fiscal policy;
- the implications of Canadian tax reform on the Saskatchewan industry; and
- tax and royalty changes in other producing provinces, particularly Alberta.

Natural Gas

The Canadian gas sector has gone through a period of transition and restructuring over the 1986-87 period as a result of implementation of the Agreement on Natural Gas Markets and Prices signed in October, 1985. The intent of the Agreement was to reduce significantly the degree of government regulation of natural gas markets, allowing prices to be determined through negotiation between buyers and sellers and giving producers and consumers access to competitive sources of supply and markets.

Throughout 1986-87, the Policy Analysis Branch has participated in federal/provincial discussions to implement the Agreement on Natural Gas Markets and Prices. Significant progress was made in removing administrative and market obstacles to deregulate interprovincial sales of natural gas. Specifically, officials of the branch have participated in the Gas Monitoring Committee representing all signatory governments to the Agreement and in submissions to federal regulatory proceedings.

The branch has been instrumental in developing new policies. The province's deregulation initiatives were introduced in February, 1987. Phase 1 of the two-phase policy removed government regulation of gas pricing, introduced a price sensitive royalty and introduced a tax on production from freehold lands. Phase 2 which will be introduced in the 1987-88 fiscal year will reduce the regulatory constraints on gas markets for both gas producers and consumers, and will also introduce a mechanism to ensure the long-term security of gas supply for provincial customers.

The overall effect of the deregulation initiatives will be to allow the market to function more freely. Producers will continue to build on the substantial growth the gas industry has experienced since 1982 and consumers will benefit from the ongoing development of secure sources of supply.

The government's drive to self sufficiency has been highly successful, to the point where Saskatchewan could today produce enough gas to supply its own needs. A major contributing factor to this success has been the development of reserves and deliverability stimulated by the export and other policy initiatives. The Policy Analysis Branch has administered the export policy announced in 1985 and monitored its success in encouraging the exploration and development of natural gas reserves.

Potash

The branch's potash-related responsibilities include "market-analysis" (providing departmental officials and policy-makers with information about potash markets) and "market development" (helping the industry develop markets for the future).

During the year, the branch:

- wrote a federal/provincial/industry study analyzing the opportunities and challenges of potash market developments in China, Indonesia, Malaysia and Thailand. This study reports on the findings of a joint mission to the countries taken early in the fiscal year.
- organized a conference in Ottawa to familiarize federal officials with the Saskatchewan potash industry and to explore opportunities for government and industry to cooperate more effectively to develop offshore markets.
- provided support for the request by the Saskatchewan potash industry that Prime Minister Mulroney give China a pilot fertilizer blending plant, which the Prime Minister did when he visited China in May 1986. It is hoped that the gift will encourage Chinese farmers to improve the balance of nutrients they apply to the soil by increasing potash use.
- organized a visit to Saskatchewan by China's agriculture minister, He Kang, who met with the Minister of Energy and Mines, received a briefing from the Potash & Phosphate Institute of Canada and Canpotex Ltd., and toured the PCS Allen potash mine and an Esso fertilizer blending outlet. The department's aim was to discuss with Minister He the need for China to increase potash use and to familiarize him with Saskatchewan's strengths as a potash supplier.
- monitored and analyzed developments in the U.S. potash antidumping case, and provided briefings to ministers concerned with the case.
- analyzed how free trade would affect the Canadian potash industry for use by the federal

government in the bilateral trade talks with the United States.

- increased the department's knowledge of potash markets and co-ordinated the department's annual ten-year forecast of potash markets.

Uranium

During the year under review, the main responsibilities of the Policy Analysis Branch continued to be the monitoring of the provincial, national and international uranium industry; and the evaluation and analysis of policy and international market issues and trends.

During 1986-87, the key emerging issue for the Canadian uranium industry was the growth of protectionism within the United States. This was reflected in the initiation of both legal and legislative actions against foreign uranium imports. Branch staff continued to consult with industry and federal government officials regarding developments in the U.S. that could result in the imposition of restrictive tariffs or quotas against Saskatchewan uranium. About 40% of the uranium mined and milled in Saskatchewan is currently exported to the United States.

The branch continued to make representations in opposition to the federal government's foreign ownership restrictions on uranium developments, and its further processing policy. The former policy requires majority Canadian ownership in uranium mine projects and limits the extent to which uranium resource development can benefit from foreign investment. The latter policy limits the marketing ability of Saskatchewan producers pursuing export sales contracts for yellowcake (which is the primary demand for uranium), since the policy generally requires further processing of the yellowcake into uranium hexaflouride (UF6) in federal Crown-owned processing facilities, located in Ontario, prior to sale.

The Policy Analysis Branch also provides analysis and advice to the government regarding a broad range of uranium and nuclear related issues of general concern to the Saskatchewan public.

Metallic Metals

The branch is responsible for monitoring and evaluating issues pertaining to all aspects of the development, production, taxation and marketing of metallic mineral resources (excluding uranium).

Branch staff participated in the joint industry/government working group implementing The Crown Mineral Royalty Schedule, 1986 which incorporated the incentive measures announced in the Mineral Industry Recovery Program.

The branch participated in interdepartmental committees addressing issues facing this sector of the industry and continued to monitor industry activity and liaise with industry officials to promote increased development activity in this sector.

Fiscal Management Branch

The Fiscal Management Branch is responsible for designing, implementing, monitoring and evaluating tax and royalty systems for the mineral resources of the province. The branch prepares forecasts of minerals production, revenues and expenditures. The main minerals considered are potash and uranium.

Potash

During the year, the major emphasis continued to be on the development of a replacement tax system for the Potash Resource Payment Agreements. (The Agreements, due to expire December 31, 1986, were extended until June 30, 1987.) Industry consultations were underway to develop a mutually acceptable tax system that could be legislated rather than in the form of an agreement.

The initiation of the antidumping case by U.S. potash producers in early 1987 postponed consultations and the branch directed its efforts to providing information and analysis on the case.

The branch continued to administer the research and development and market development incentive program which has proved very effective in encouraging initiatives to improve our competitive position and expand markets for Saskatchewan potash.

Flooding problems at a number of the potash operations were monitored. Discussions with industry commenced to examine opportunities to establish a longer term research and development program which would focus on the preventive detection and avoidance of water inflow problems. It would also enhance the exchange of technical information within the industry regarding the nature and successful resolution of water inflow problems.

Discussions were initiated with industry on the development of royalty structures relating to the production of calcium chloride and potassium sulphate in the province.

In the transportation area, the impact of the proposed changes to the National Transportation Act were considered. Assistance was provided to the Department of Highways and Transportation in the preparation of a study assessing the burden of transportation costs borne by Saskatchewan industry. The branch participated in an inter-governmental working group that considered ways that advanced technologies could be employed to minimize transportation costs. Also, transportation subsidies provided to the New Brunswick producers continued to be monitored and objected to at every opportunity.

Assistance was given to industry officials, departmental staff and other government agencies in the interpretation of the agreements and regulations as well as to provide statistical and operational information with regard to the potash sector.

Uranium

During the year branch staff undertook major development work on the department's Uranium Price and Sales Forecasting Model and initiated the computerization of all uranium production and sales statistics in order to have rapid access to the extensive statistical information on file. This will enhance the branch's capability to continue to monitor the performance of the Saskatchewan uranium industry, and the evolving trends in uranium marketing and pricing. Staff also participated in the revenue and economic forecasting exercises of the government.

Consultations continued with industry with respect to the review and modifications of the uranium royalty regime. The review also involved staff from the Policy Analysis and Mineral Revenue Branches.

Technology Branch

The Technology Branch has responsibility for aiding the development and application of new technology related to petroleum and lignite coal. Saskatchewan has enormous reserves of these resources and significant benefits will accrue to the province — and to the rest of Canada — as more efficient and cheaper methods are developed to produce and utilize these resources.

In order to fulfill its responsility, the Technology Branch:

- plans and delivers funding programs to facilitate desirable research, development and demonstration (r, d & d) initiatives related to petroleum and lignite coal;
- monitors r, d & d activities in Saskatchewan, Canada and internationally in order to maintain a current perspective on new technological developments related to petroleum or lignite coal.

The Technology Branch represents Saskatchewan Energy and Mines on the Intergovernmental Secretariat which supports the Action Committee on Western Canadian Low-Sulphur Coal. The Action Committee is chaired by Canada's Deputy Prime Minister and the Ontario Premier is the Vice-Chairman. The Premiers of Saskatchewan, Alberta and British Columbia are the other members of the Committee. The Action Committee was established to investigate means to improve the competitiveness of western Canadian low sulphur coal in order to expand its potential use by Ontario industry.

The Technology Branch is also responsible for advising the government regarding alternative energy and energy conservation issues referred to the department.

The Heavy Oil/Fossil Fuels Research, Development and Demonstration Program

This program is intended to encourage research activity and the demonstration of new technologies which will contribute to the increased production and utilization of Saskatchewan's energy resources. The program places particular emphasis on heavy oil but considerable support is also given to projects involving lignite coal and the enhanced recovery of light and medium oils.

Saskatchewan has significant reserves of heavy oil and lignite coal which are of strategic importance to future economic development in Saskatchewan and long-term energy security for Canada. The development of Saskatchewan's heavy oil will generate an enormous amount of industry investment and job creation. The rest of Canada will also benefit through the purchase of goods and services by the oil industry and through the increased production of oil to meet Canada's future energy demands. However, the development of Saskatchewan's heavy oil and lignite resources is limited by various technical constraints.

The high density and high viscosity of heavy oil combined with the thin, unconsolidated sandstone reservoirs in which it is found make it difficult to produce. Only 5 percent of the heavy oil-in-place can be produced by primary recovery techniques. As well, heavy oil is difficult to transport and needs to be upgraded to increase its utilization.

Lignite is a low quality coal. Its high moisture content, high ash content and low energy content limit the potential uses for lignite, reduce its value, and restrict the distances over which it may be economically transported.

Saskatchewan and the federal government agreed to share the costs of the Heavy Oil/Fossil Fuels R, D & D Program in order to develop the technology required to overcome the constraints inhibiting the development of our heavy oil and lignite resources. The Heavy Oil/Fossil Fuels Program is being implemented under two federal-provincial agreements:

- The Canada-Saskatchewan Heavy Oil Agreement, signed in 1976, and
- The Canada-Saskatchewan Heavy Oil/Fossil Fuels Agreement, signed in 1983.

As of March 31, 1987, these two agreements have provided a total of $24.7 million to forty-seven projects approved under the terms of the program.

Among the program's major accomplishments in 1986-87:

- An agreement was reached between Saskatchewan Energy and Mines and Sceptre Resources Limited and Murphy Oil Company Ltd. for the Tangleflags North Steamflood Pilot Project. This project will include drilling of the first horizontal oil well in Saskatchewan. Horizontal well technology has the potential to significantly reduce production costs and to substantially increase the amount of heavy oil that may be recovered from a reservoir. The project will involve a total investment of over $13 million and will create 150 man years of employment over its life. If the pilot project is successful, commercial-scale development may be undertaken at the project site as early as 1990.

- Saskatchewan Energy and Mines reached an agreement with Dome Petroleum Limited and its partners, the Saskatchewan Oil and Gas Corporation and Shell Canada Limited regarding funding for a pilot project to identify the optimum processes and conditions for the economic extraction of carbon dioxide from the flue gas of the Boundary Dam coal-fired power plant near Estevan. If a technically and economically successful extraction process can be identified, the carbon dioxide that would be produced from such a facility could be used to enhance recovery in the light and medium oil pools in the south-east area of the province. The carbon dioxide is absorbed by the oil causing it to swell and increasing its mobility which makes it easier to recover.

In 1986-87 the Heavy Oil/Fossil Fuels R, D & D Program provided over $4.8 million in funding to the following thirty-three projects:

- Study of Heavy Oil Potential of Mississippian Carbonate Rocks of South Saskatchewan.
- Development of an Automatic Variable Speed Controller for Heavy Oil Applications.
- Development of an Electronic Continuous Fluid Level Monitor.
- Development of Operational Guidelines for Tangleflags North Steamflood Project.
- Remote Sensing for Petroleum Exploration and Exploitation in Saskatchewan.
- Feasibility Study of the Design and Economics of a Shaft for the Recovery of Heavy Oil.
- Evaluation of the Potential for Application of Shaft and Tunnel Access, Gravity Drainage Enhanced Oil Recovery Techniques to Saskatchewan Oil Reservoirs.
- Combustion Tube Studies for Saskatchewan Oil Reservoirs.
- Thermal Studies of Saskatchewan Heavy Oil Core Samples.
- Fluid Characterization of Saskatchewan Reservoirs.
- Enhanced Heavy Oil Recovery by Carbon Dioxide Injection.
- Characterization and Treatment of Saskatchewan Heavy Oil Emulsions.
- Evaluation of Upgrading Characteristics of Saskatchewan EOR Feedstocks and Distillate Fractions.
- Development of an EOR Pilot Project Program.
- Enhanced Oil Recovery by Steam Injection.
- High Pressure Miscible Displacement in Saskatchewan's Light and Medium Oil Reservoirs.
- Data Base for the Petroleum Division.
- Sand Control Studies.
- Scoping Study of a Novel Recovery Process for Saskatchewan Heavy Oils.
- Acid Gas Reduction Project.
- Petrographic Studies of the Ravenscrag Coal Deposits.
- Potential Environmental Effects of Drilling Fluids on Crops and Soils in Saskatchewan.
- Eyehill In-Situ Dry Combustion Project Data Base.
- Boundary Dam CO2 Pilot Plant.
- Marketing Study of Saskatchewan Lignite.
- Evaluation of Heavy Oil/Fossil Fuels Program.
- Micro-FTIR and UV-Fluorescence Spectroscopy of Coal.
- Tangleflags North Steamflood Pilot Project.
- Pyrolysis and Oxidation of Saskatchewan Heavy Oils.
- Evaluation of Transportation Options for Heavy Oil in Saskatchewan.
- Coal Liquefaction Study.
- Lloydminster Area Processing Study.
- API Gravity Improvement of Saskatchewan Heavy Oils Using Low Conversion Upgrading Processes.

Further information is available from the Technology Branch regarding the projects funded under the Heavy Oil/Fossil Fuels R, D & D Program.

Special Projects Branch

The Special Projects Branch manages provincial involvement in major energy projects undertaken in the province and trade related matters affecting the resources commodities which fall within the department's mandate.

More specifically the branch:

- is the main government agency responsible for the NewGrade and Husky bi-provincial upgrader projects;
- monitors all aspects of international trade as it may relate to Saskatchewan's mineral and oil sectors;
- assesses the impacts on Saskatchewan's mineral and oil sectors of any developments in the international trade area; and
- prepares response options for the province with respect to developments in this area and co-ordinates the implementation of any response the province may wish to undertake.

During the past year the branch completed negotiations on the ownership and operating agreements for the NewGrade Upgrader project, as well as finalizing the overall financing package for NewGrade. Ongoing negotiations also continued with respect to the Husky bi-provincial upgrader at Lloydminster.

In terms of trade the branch was actively involved in monitoring trade actions in the United States with respect to potash, uranium, and natural gas. A large part of this involved ongoing work with the Trade Secretariat on matters relating to the Canada-U.S. Free Trade talks and their possible impact on the province's resource sectors.

Geology and Mines Division

Les Beck
Executive Director

The division is responsible for all geoscientific activities by the department; storage and synthesis of exploration, mining and production data submitted by the mining and petroleum industries; and disposition of all Crown minerals other than petroleum and natural gas, oil shales and helium. The primary aim of the division is to promote exploration and development opportunities for the petroleum and mineral industries in the province through publications, up-to-date technical inventories, core collections, symposia, open house meetings and individual consultations.

In view of the escalating precious metals activity in northern Saskatchewan and the increased demand for mineral deposit information, the Mineral Development Section of the Geological Survey was elevated to branch status on August 1, 1986. For the remainder of the year the responsibilities of the division were undertaken by the following three branches:

- Geological Survey
- Mineral Development
- Mines

Geological Survey Branch

The Geological Survey is responsible for maintenance and enhancement of the geoscientific information base for the province, particularly with respect to petroleum and natural gas, industrial minerals such as potash, coal, salt and sodium sulphate, and the metallic minerals, especially uranium, gold, copper and zinc. This responsibility involves centralized storage and management of data received from industry and, most importantly, the synthesis of such data with investigative work conducted by the Survey into the geological controls governing location and extent of the mineral resources. These syntheses provide the geological framework for oil and mineral industry exploration, which leads to enhancement of the known resources and discovery of new ones. They also serve as the basis for rational decisions by the department in the regulatory and fiscal aspects of resource management.

Success in this role demands effective communication and liaison with industry and other government agencies. This is accomplished by ensuring ready access to Survey staff for consultation with industry representatives, through the permanent Saskatchewan Geological Liaison Committee and the annual Open House Meeting, and by support of symposia sponsored by the geological societies. Contact with the geological surveys of other provinces is maintained through internal meetings and forums, such as the Committee of Provincial Geologists, and through federal-provincial management committees.

As a result of falling commodity prices, particularly in the petroleum and potash sectors, work in the Survey during the year was influenced by:

- reduced data inflow from petroleum exploration, thus allowing for restoration of subsurface geological investigative work;
- increased attention to the study of problems arising from potash mining; and
- increased funding, through a grant from the Heritage Fund, to augment mapping of the gold-bearing trends in northern Saskatchewan in support of surging exploration activities by industry.

Work under the first area received parallel support from the Geological Survey of Canada, which, through funds from the Office of Energy Research and Development and logistical support from the Petroleum and Natural Gas Division, initiated a detailed analytical study of Saskatchewan petroleum source beds. Work under the latter two areas was largely funded by the five-year $6.38 million Canada-Saskatchewan Subsidiary Agreement on Mineral Development (MDA), which was in its third year during 1986/87.

The 1986 Saskatchewan Geological Survey Open House was attended by over 300 representatives from industry. Participation was shared with the Universities of Saskatchewan and Regina, the Saskatchewan Research Council, the Geological Survey of Canada, the Mineral Policy Sector of Energy and Mines and Resources Canada, and numerous industry representatives. The Open House meeting was held in conjunction with the Saskatchewan Geological Society Symposium "Economic Minerals of Saskatchewan". Attendees at the combined meeting represented a cross-section of the Canadian mineral industry.

Editorial and Cartographic Section

The Editorial and Cartographic Section handles the editing and production of all geoscientific reports and maps published by the branch. In addition, with the transfer of the Drafting Section of Administrative Services Branch to the Geological Survey Branch on June 1, it assumed responsibility for all other drafting services to the department. The section now consists of two working units: Survey Drafting and General Drafting.

The Survey Drafting Unit prepares thematic monochrome and colour maps and text figures to the plate-ready stage. These include compilation bedrock geology and metallogenic maps at 1:250,000 scale, outcrop geology and contour maps at various scales, stratigraphic cross-sections, and small-size maps and diagrams for inclusion in reports. During the fiscal year, the unit produced ten publications comprising 565 pages and 61 maps; four reports were reprinted. In addition, approximately 25 percent of the cartographic staff's time was spent on special projects such as text figures for magazine articles and papers in scientific journals, slides for conference presentations and graphics for conference displays.

The General Drafting Unit maintains the mineral disposition maps, well location maps, pool boundary maps and potash and coal lease maps. They also

prepare the maps for the quarterly Petroleum Land Sale, produce an annual update of the Mineral Development Map, prepare numerous text figures, slides and graphics for all areas of the department, and handle all small blueprint orders for internal use and for sale through the Publications Office.

Computerization of the well location maps, a project carried out jointly with the Central Survey and Mapping Agency, was completed during the year and investigations were begun into acquisition of the hardware and software needed to update and produce the maps within the department. Work continued on renewal of the bases for the mineral disposition maps, with the scale being standardized at 1:50,000, and on the preparation of a new series of tied structure contour maps to replace the old K-series maps.

1986/87 Publications

Budding, A.J. and Kirkland, S.J.T. (1956): The geology of the Reindeer River area; Sask. Dep. Miner. Resour., Rep. 22, 42p (reprinted 1986).

Coombe, W. (1984): Gold in Saskatchewan; Sask. Energy Mines, Open File Rep. 84-1, 134p (reprinted 1986).

Fuzesy, A. (1979): Index to assessment work in the La Ronge Mining District of Saskatchewan; Sask. Miner. Resour., Misc. Rep. 79-4, 186p (reprinted 1986).

Fuzesy, A. (1985): Assessment work catalogue, La Ronge Mining District; Sask. Energy Mines, Misc. Rep. 85-5 (supplement to Misc. Rep. 79-4), 132p (reprinted with addenda 1986).

Harper, C.T. (1986): Geology of the Nevins — Forsyth Lakes area; Sask. Energy Mines, Open File Rep. 86-4, 57p.

Lane, D.M. (1987): Subsurface carbon dioxide in Saskatchewan: sources and potential use in enhanced oil recovery; Sask. Energy Mines, Open File Rep. 87-2, 40p.

Macdonald, R., Sibbald, T.I.I. and Paterson, D.F., eds. (1986): Summary of Investigations 1986, Saskatchewan Geological Survey; Sask. Energy Mines, Misc. Rep. 86-4, 192p.

Parslow, G.R., Gaskarth, J.W. and Zhang, J.L. (1986): Geochemistry of the Annabel Lake area; Sask. Energy Mines, Open File Rep. 86-3, 154p.

Schreiner, B.T. (1986): Quaternary geology as a guide to mineral exploration in the southeastern shield, Saskatchewan; Sask. Energy Mines, Open File Rep. 86-5, 39p.

Scott, B.P. and Slimmon, W.L. (1986): Compilation bedrock geology, Lloyd Lake, NTS area 74F; Sask. Energy Mines, Rep. 231 (1:250,000 scale map with marginal notes).

Scott, B.P. (1986): Geology of the Phelps Lake (southwest) area; Sask. Energy Mines, Open File Rep. 86-2, 12p.

Scott, B.P. (1986): Metallogenic map series, Foster Lake, NTS area 74A; Sask. Energy Mines, Rep. 252 (1:250,000 scale map with marginal notes).

Slimmon, W.L. (1986): Lloyd Lake (NTS 74A) geological bibliography; Saskatchewan Energy and Mines, Data File 11, 6p.

Suryam, J.V. (1986): Seismic compilation, Souris River area, southeastern Saskatchewan; Sask. Energy Mines, Map SM-1, scale 1:126,720.

Precambrian Geology Section

The role of the Precambrian Geology Section is to compile and maintain an inventory of, and produce models of, the regional and mineral deposit geology, geochemistry and related geoscience data for the northern Precambrian Shield region of the province. This information is used primarily by the mineral exploration industry, but also supports other development and diversification programs. The section interfaces strongly with the Mineral Development Branch in these activities.

Field Program — This activity is currently funded under the Canada-Saskatchewan Subsidiary Mineral Development Agreement 1984-89 (MDA), a geoscience program aimed principally at stimulating and assisting the mineral industry to explore for and develop gold and precious metal deposits in northern Saskatchewan. The program has a total budget over five years of approximately $6 million, split 50:50 on a joint delivery basis between the federal and provincial governments. There was an operational expenditure by the province in 1986-87 of approximately $490,000. The federal component, managed by the Geological Survey of Canada, comprised airborne geochemical and geophysical surveys, as well as detailed mineral deposit and regional geological studies.

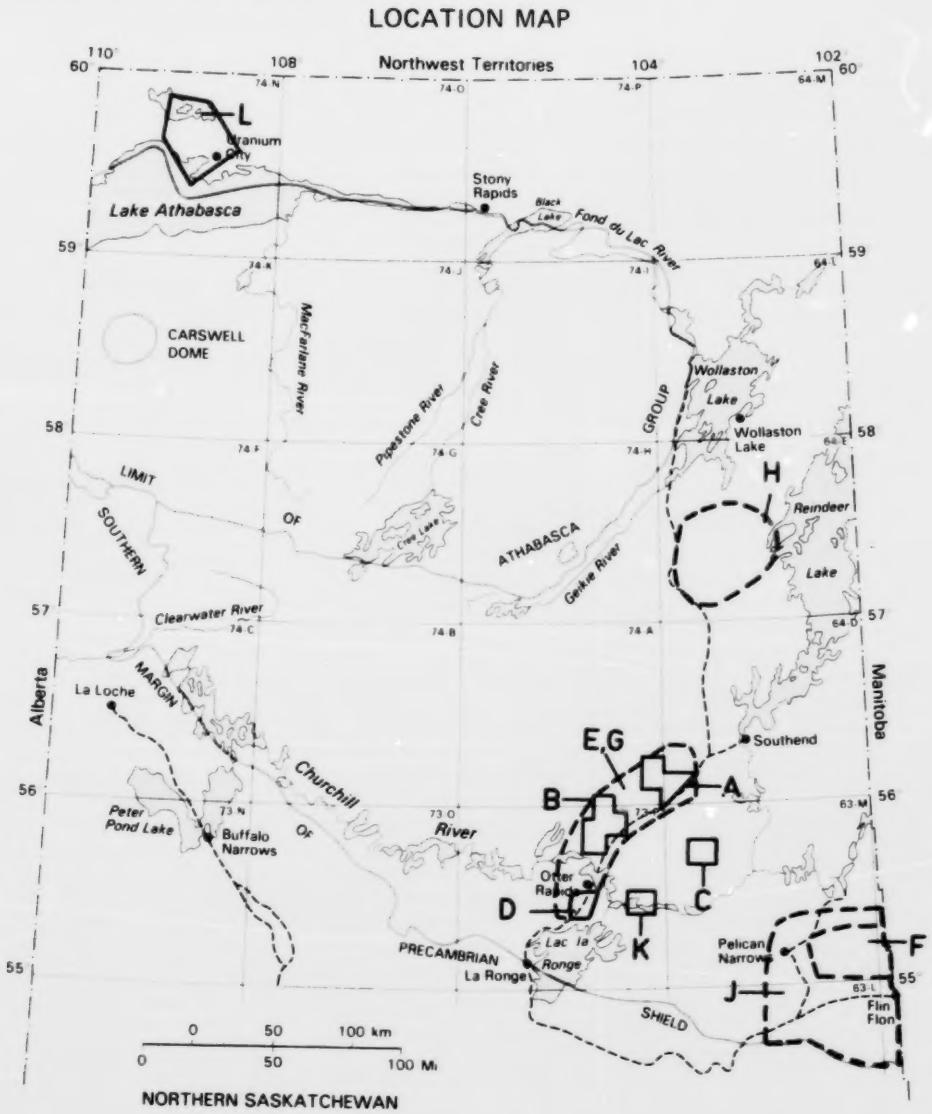
The provincial effort, the "Gold Belt Geology" program, includes geological mapping, geochemistry, isotope geology and related mineral deposit studies in areas which are currently undergoing very active exploration for gold. The provincial region of operation was almost entirely restricted in 1986-87 to the triangle of country between La Ronge, Reindeer Lake and Flin Flon (Figure 1).

Bedrock Geological Mapping — In view of the value of the bedrock mapping programs to the mineral industry's current search for gold in northern Saskatchewan, and in order to boost geological student employment in the north, the province provided another $100,000 in 1986-87 under a Geoscience Expansion Program. The extra funds permitted a new bedrock mapping project in the Laonil Lake area and an acceleration of mapping in the Central Metavolcanic Belt, two regions of high gold potential and current mine development. The Saskatchewan Geological Survey was also able to commence remapping of the Sulphide-Hebden Lakes area.

Bedrock mapping continued into the third year in the important gold-bearing La Ronge Central

Figure 1

Precambrian Geology Section Field Projects under the MDA Program. Letters show approximate location of projects described in text. Area under A and B coincides approximately with the Central Metavolcanic Belt (the "La Ronge Gold Belt").



Metavolcanic Belt, a region of several potential mines. Mapping is now essentially complete in the northern part of the belt, covering the area extending from Waddy Lake through Windrum Lake (A, Figure 1). This region includes several well-known gold deposits (e.g., Komis, Weedy, Jojay) and the more recently discovered Tower Lake locality. Geological environments favourable to gold occur on both flanks of this belt and along the cross-cutting Byers Lake Structure which is associated with the Tower Lake deposits; a number of exploration models have been proposed.

Although the Esmay Lake area in the southern part of the belt does not appear, after the summer's mapping, to have quite the potential of some other parts of the region, a number of exploration models have been advanced (B, Figure 1), in particular for a belt along the eastern margin.

The Laonil Lake mapping (C, Figure 1) is the first detailed work in the region. A geological model produced in relation to the known deposits at Seabee suggests the presence of other favourable gold-bearing environments southeastwards towards Uskik Lake, and at other sites to the south.

The remapping of the Sulphide-MacKay-Hebden Lakes area was divided between four geologists, each working for part of the season (D, Figure 1). The area has been known for many years to host gold occurrences, and has been fairly intensively explored. A model for the regional geology has been formulated. The gold deposits here are of a somewhat different type to those elsewhere, and more light has been shed on their relationship to the geology.

Supporting Studies — A number of projects supportive of the regional geoscience program were mainly contracted out to, or joint-ventured with, university personnel, as in previous years. Geochemical studies were continued in the La Ronge and "Kisseynew" areas (E and F, Figure 1). Geochronological and isotope geology studies were undertaken again at Carleton University (G. Figure 1) and through the University of Regina (H, Figure 1). A highly leveraged geochronological joint venture with the University of Kansas was continued into a fourth year (J, Figure 1).

This work included bedrock mapping of an area around Nistowiak Lake (K, Figure 1). The results of these determinations help to provide a chronological framework for classifying bedrock units in the north, leading to improved exploration models. A final report was received on a study of the Martin Group in the Uranium City area (L, Figure 1), with some indications of gold enrichment.

Precambrian Geodata — The regional geoscience data base includes rock and mineral sample collections and other files which are available for examination. These files are in process of full computerization (mainframe and micro).

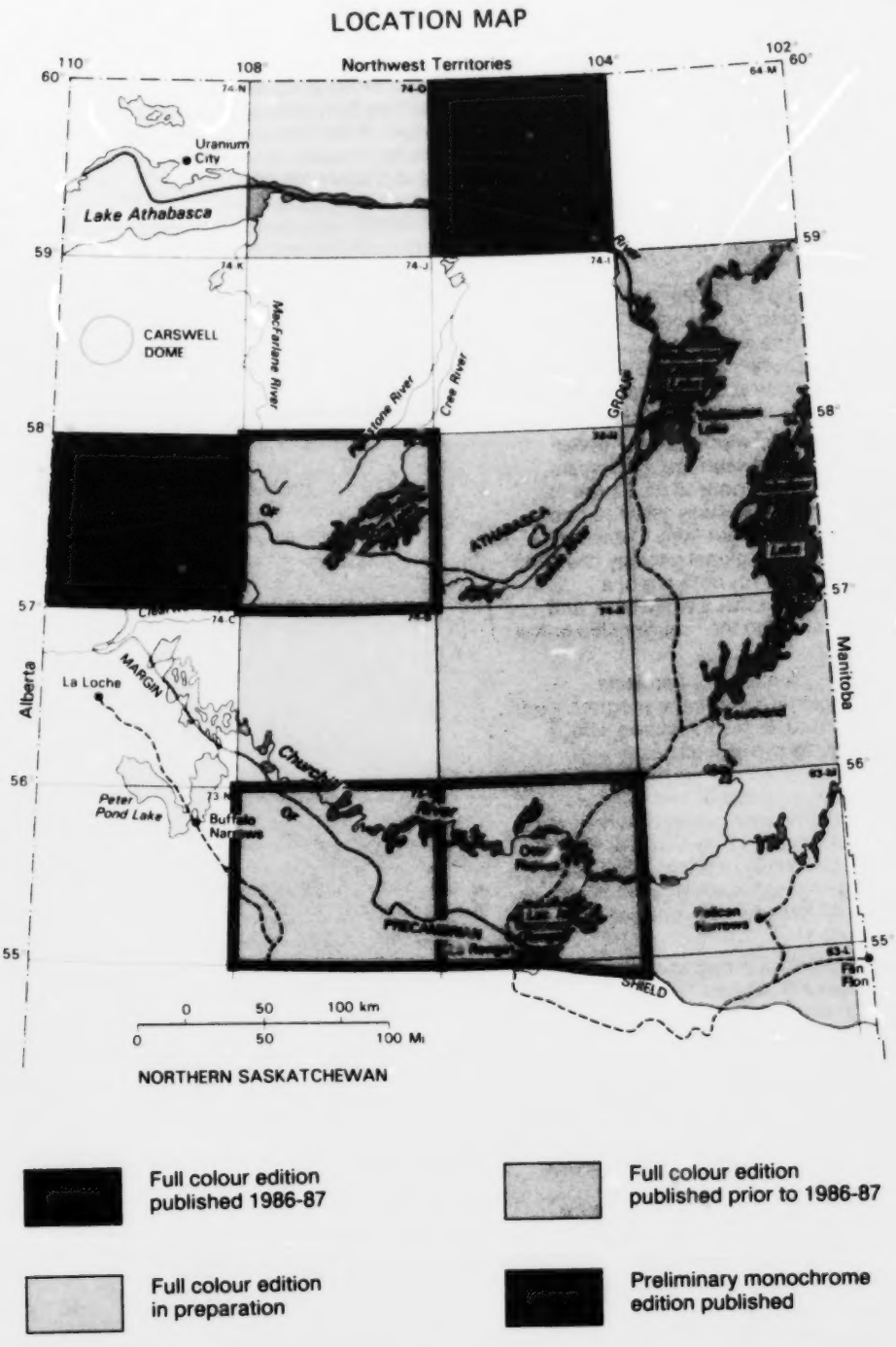
Publications and Presentations — Published and open file reports are issued periodically, based upon field programs, consultants' reports and in-house compilations. A coloured compilation bedrock geology map series of the Precambrian Shield area is now over 60 per cent complete in first edition (Figure 2). During the year, one new map was released in full colour (74F) and five more were in the process of final compilation (64L, 64M, 74B, 74F and 74O).

Section geologists also contributed the major part of the Saskatchewan Geological Survey Open House presentation in November 1986, which was attended by a wide spectrum of mineral industry people. Presentations have also been made at other meetings held in North America. Staff were involved in the preparation of a guidebook and road log pertaining to La Ronge Gold Belt geology for the Geological Association of Canada Annual Meeting in Saskatoon, as well as a review article on the Saskatchewan Mineral Industry for the Canadian Institute of Mining and Metallurgy.

Erratum -- Figure 2, page 18

THE HEAVY BLACK LINES ON THIS FIGURE SHOULD BE DISREGARDED

Figure 2
Precambrian Compilation Bedrock Geology Maps, 1:250,000 scale.



Geodata and Industrial Minerals Section

Industrial Minerals Unit

The principal functions of the section are regulatory, advisory, planning, research and informational. The section monitors exploration and development in the field of industrial minerals, and receives, assesses and maintains a base of technical data arising from work conducted by industry. Consultation on technical matters relating to industrial minerals is provided to industry, Federal and Provincial government agencies and the public. Planning of resource investigations and research is carried out on the basis of technological, developmental and market trends and opportunities, and on the basis of government and industry needs. Technological and resource data files, including assessment work submissions by industry, are maintained for purposes of monitoring developments in the industry, planning, consultation and identification of industrial opportunities.

Other functions of the section include:

- the review of coal-related program proposals and technical reports arising out of the Canada-Saskatchewan Heavy Oil-Fossil Fuels Agreement;
- the review of Environmental Impact Statements submitted by industry and relating to proposed industrial developments;
- co-secretarial function for the Canada-Saskatchewan Mineral Development Agreement, as well as a technical advisory and planning role in the Technology and Development Sectors of the Agreement; and
- assistance in the revision of regulations pertaining to industrial minerals.

During the fiscal year four projects were in progress:

- Potash Mine Geology Project: This project is contracted to the University of Saskatchewan under the Provincial portion of the Canada-Saskatchewan Mineral Development Agreement (MDA). Significant progress was made in the study of anomalous ground (largely salt horses) in potash mines. Rubidium-strontium dating, oxygen isotope geochemistry and X-ray diffraction analyses have led to a means of correlation within anomalous areas and differentiation among major periods of brine invasion. The project is designed to characterize and establish the means for predicting the presence and nature of salt anomalies and assessing the likelihood of communication with overlying and underlying aquifers.
- Potash Mine Data Compilation: The project, which was contracted under the Provincial portion of the MDA program, comprises a bibliography of all available potash mine records relevant to geological anomalies in potash mines. The bibliography was submitted in draft form by the contractor. In-house efforts are being made to organize the data into an open file format. Due to circumstances beyond the Department's control, the notes relating to anomaly classification and methodology, as well as the anomaly distribution maps, will likely not be available for publication.
- Geology of the Winnipegosis and Dawson Bay Formations in the Esterhazy-Rocanville-Bredenbury Potash Mining Region: This project is being undertaken independently of the MDA program. Its main purpose is to define the geological conditions in the region which may have a bearing on the problem of brine inflow into potash mines. For the sake of efficiency and cost saving, it was decided that this study be combined with an earlier study of the petrology of potash-bearing members of the Prairie Formation. At fiscal year-end, the project was about six weeks from completion.
- Compilation of a report on the geology and development of industrial minerals in Saskatchewan with an accompanying map of industrial mineral deposits, occurrences and developments: Little progress was made on the report due to higher priority demands on staff time. However the map was near completion at fiscal year-end.

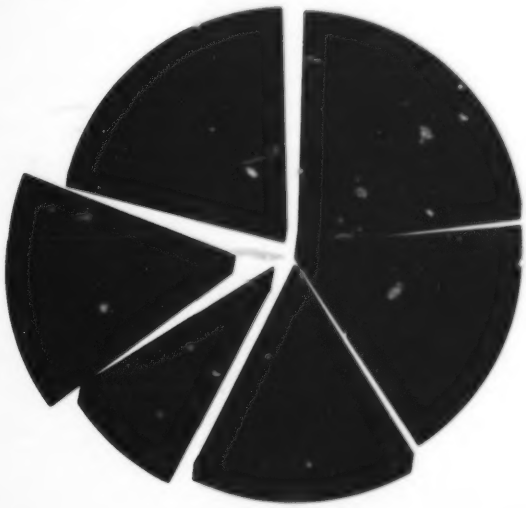
The section took a lead role in proposing, planning and developing the terms of reference for an extension to the building stone project conducted in 1985 under Federal MDA funding. The extended program will include the sampling of three granitic bodies and Ordovician dolomites in northern Saskatchewan, and a market study.

Discussions were initiated with Federal MDA authorities for the provision of funds to assist the Saskatchewan Research Council in accelerating their aggregate resource program. If an agreement is reached, the program will give priority to regions of the province suffering from a shortage of aggregate materials.

Twelve technical submissions were reviewed during the fiscal year. These relate to mineral exploration, environmental impact assessment, Federal-Provincial programs and the Securities Commission. The section was also involved in the preparation of a guidebook and road log relating to industrial minerals for the Geological Association of Canada Annual Meeting in Saskatoon, as well as a review article on the Saskatchewan Mineral Industry for the Canadian Institute of Mining and Metallurgy.

A total of 181 technical inquiries on a wide variety of industrial minerals were handled by the section. A large proportion of the enquiries originated from industry and government agencies. Figure 3 illustrates the distribution of enquiries.

Figure 3
Distribution of Inquiries Pertaining to Industrial Minerals.



Well Records Unit

The unit manages the manual and computerized storage of all information from wells drilled under the Oil and Gas Conservation Regulations. It also provides information services to the petroleum and natural gas industry and to any other agency or individual requiring geotechnical data from wells drilled under the regulations.

The sharp drop in drilling during the fiscal year was reflected in most activities of the unit. However, the decreased activity permitted staff to clear backlogs in well coding, supplementary data additions and other file updating and maintenance.

During the fiscal year, 906 new well files were set up and 1,788 new wells were coded and added to the computerized file. Supplementary data were added to 4,784 well records. Demand for data decreased from the previous year. Nearly 27,000 files were pulled for industry and nearly 43,000 pages of data were photocopied. The unit processed over 14,000 data submissions and mailed nearly 800 letters requesting overdue data. Out of a total of 63 computer searches, 39 were conducted for industry.

Purchases of the complete Geodata Systems tape increased from three to six. An additional eight companies requested sample tapes prior to possible purchases of the complete system.

Geophysical Unit

The geophysical unit issues geophysical licences, crew certificates and permits to handle and fire explosives, and grants program approvals under the terms of the Sedimentary Basin Geophysical Exploration Regulations. The unit also monitors geophysical activity, manages a bank of technical data submitted by industry and provides geophysical information and consultation services to industry, government agencies and the public.

Geophysical exploration for oil and gas was more or less evenly distributed among the four main oil-producing districts in the province. Exploratory activity was reduced considerably from the previous fiscal year. The consequence was a reduced demand for the services of the unit, as is demonstrated by the following table:

	1986	1985
Geophysical Licenses issued	52	108
Crew Certificates issued	101	231
Permits issued	111	342
Exploration programs processed, approved and registered	307	447
Resource maps and reports sold to industry	557	3,349
Geophysical data packages prepared for the petroleum land sales	76	200

During the fiscal year, discussions with industry led to the release of geophysical data acquired under the Petroleum Incentives Programs (P.I.P.). The data cover about 16,000 line km of seismic surveys.

The unit completed a major revision and update of the geophysical map and report files and related index in preparation for computerizing the index. Altogether, about 12,000 seismic, gravity, magnetic and miscellaneous maps were processed.

Technical and administrative consultation on geophysical, technical and regulatory matters were provided to numerous visitors and callers from industry.

The geophysical unit was engaged in two projects during the fiscal year:

- Hydrocarbon Potential of Southern Saskatchewan, comprising seismic maps on the Birdbear and Mississippian, a regional gravity map, a regional seismic map and a technical report. At fiscal year-end, the project was near completion.
- Composite Seismic Contour Map (SM-1) of the Souris Area. This map is completed and available to the public.

Petroleum Geology Section

The Well Information System was kept up-to-date with 1,411 well logs being picked, the formation tops coded and entered directly through the interactive terminal system. The system was also used to obtain information directly, including print-outs, for geologists working on projects.

Another eleven cross-sections were added to the southern Saskatchewan grid series, bringing the total number produced to twenty-four.

The two projects completed during the fiscal year were published:

- "Evaluation of Saskatchewan's Heavy Oil Reserves" as an open file report (without a number); the Base Water Maps have subsequently been completed and added to the text.
- "Subsurface Carbon Dioxide in Saskatchewan: Sources and Potential Use in Enhanced Oil Recovery" as Open File Report 87-2.

Four projects were initiated during the year:

- Geology of the Dawson Bay Formation (Devonian) in Southwestern Saskatchewan
- Geology of the Medicine Hat Sand (Cretaceous) in Southwestern Saskatchewan
- Development of a Depositional Model for the Oil-Prone Jurassic Section in the Wapella-Moosomin Area, Southeastern Saskatchewan
- Geology of the Interlake Group (Silurian) in Saskatchewan

The section coordinated a crude oil sampling program, obtaining samples from field staff of the Petroleum and Natural Gas Division and sending them to the Geological Survey of Canada in Calgary. Preliminary results have been released by them (Project 78003).

Professional consultations with industry continued, as did educational lectures and seminars both within and outside the Department. Section staff were involved in preparation of a review article on the Saskatchewan Mineral Industry for the Canadian Institute of Mining and Metallurgy and the proceedings volume from the "Economic Minerals of Saskatchewan" symposium held in conjunction with the Survey's Open House Meeting in November.

Subsurface Geological Laboratory Unit

During the fiscal year, the laboratory recorded the following activities:

- New core received: 4,721 boxes from 302 wells, increasing core in storage to 266,120 boxes.
- Drill cutting samples washed, catalogued and stored: 53,412 from 207 wells.
- Drill cutting samples washed and catalogued for shipment to Energy, Mines and Resources Canada: 43,071.
- Samples shipped to Energy, Mines and Resources Canada: 49,175.
- Number of industry users of the laboratory: 109 from 69 firms.
- Number of other users of the laboratory: 15 from 4 establishments.
- Cores examined: 30,664 boxes from 1,968 wells.
- Samples examined: 90 wells.
- Temporary removal of core from lab: 60 wells.
- Thin sections prepared for staff: 1,527.

Mineral Development Branch

The branch is responsible for maintenance of the mineral exploration assessment files and the Saskatchewan Mineral Deposits Index, for evaluation and geological studies of metallic mineral deposits of northern Saskatchewan and for programs run through the offices of the resident geologists in La Ronge and Creighton. In addition, the section disseminates information about metallic mineral deposits, mineral industry activities and mineral development opportunities in northern Saskatchewan, at both technical and general levels.

A total of 552 mineral exploration assessment files submitted under the Mineral Disposition Regulations were processed, 132 visitors received and 139 requests for information handled.

Work continued on the Saskatchewan Mineral Deposits Index with documentation of new occurrences and updating. The index provides a primary reference for mineral exploration and land use planning. A total of 10 major requests for index data were handled.

The level of information requests remained high, primarily as a result of the current gold exploration boom in northern Saskatchewan.

Studies of metallic mineral deposits and their geological settings were continued under the Geoscience Program of the five-year (1984-89) Canada-Saskatchewan Subsidiary Mineral Development Agreement. Projects centred on the Sulphide Lake area, north of Lac La Ronge, and on the Mari and Schotts Lakes area, north of Flin Flon. Another project followed up lake bottom sediment gold anomalies identified in an earlier phase of the Geoscience Program.

The mineralized core collection, stored in La Ronge and administered through the office of the resident geologist, received additions totalling some 3582 m from uranium deposits in the Athabasca Basin and from gold deposits in the La Ronge and Flin Flon gold belts. Some 720 m of stratigraphic core were also collected from the northern part of the Athabasca Basin. Thirty-six persons examined core from the collection during the fiscal year.

The 1:250,000 scale metallogenic map series established in 1984-85 received ongoing attention and one new map sheet was published, a second prepared for publication and two were in preparation at year end. These maps provide details of location, metal association, development status and type of mineralization, as well as reference to information on all noted mineral occurrences. They augment a similar scale compilation bedrock geology series and provide a valuable reference for the mineral exploration industry.

The Prospectors' School was run in conjunction with the La Ronge Community College, by branch staff. The school offers a basic six-week mineral prospecting course to students of all ages primarily from northern communities. A total of 15 students graduated. The course is deemed particularly

valuable in view of the continuing interest in gold exploration in northern Saskatchewan.

The resident geologists, through offices in La Ronge and Creighton, monitor the mineral exploration industry in northern Saskatchewan and also assist it by providing up-to-date information on exploration and mining activities and opportunities. The offices maintain files of current mineral claim maps, airphotos, geological maps and reports, and assessment work submissions for their respective districts. In the current fiscal year, some 1,800 visitors were recorded at the resident geologists' offices.

Section staff were involved in the preparation of a review article on the Saskatchewan Mineral Industry for the Canadian Institute of Mining and Metallurgy.

Mines Branch

This branch is responsible for the disposition, development and conservation of all Crown minerals with the exception of petroleum, natural gas, helium and oil shale. The activities of the branch are carried out through the Mining Lands Section and the Mining Operations Section.

Mining Lands Section

Mining Lands administers and disposes of Crown minerals under the following regulations:

- The Mineral Disposition Regulations, 1986 (uranium, base and precious metals)
- The Quarrying Regulations, 1957 (sand, gravel, clay, bentonite and other quarriable substances)
- Alkali Mining Regulations (sodium sulphate)
- The Coal Mining Regulations, 1957 (coal)
- The Subsurface Mineral Regulations, 1960 (potash, salt)

Figure 4
New Areas Acquired Under Claims, Claim Blocks and Permits

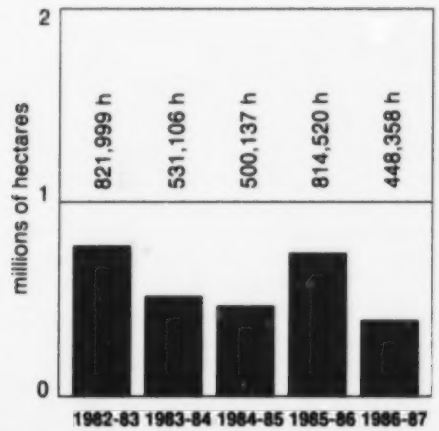
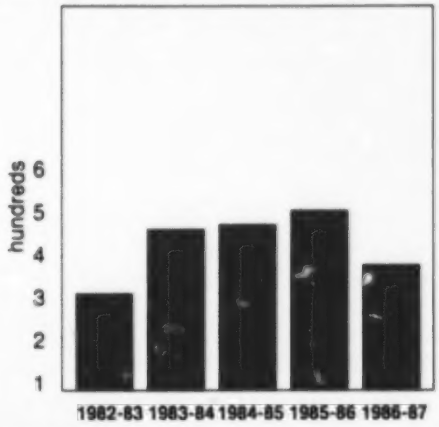


Figure 5
Number of Claims (Claim Blocks) Staked



Activities of the section are centred in Regina, but a field office is also maintained in La Ronge to permit local administration of regulations.

The Mineral Disposition Regulations, 1986, came into effect on April 8, 1986, replacing regulations which had been in effect since 1961. Under the new regulations, a total of 387 new mineral claims covering 448,558 hectares were taken out during the year, a decrease of about 45 per cent from the area taken out in new claims and permits in the previous year (Figures 4 and 5).

On March 31, there were 3,387,205 hectares held under 3,730 mineral claims; 1,229,409 hectares held under 19 prospecting permits; and 1,100,905 hectares held under 740 leases. The total area held was 5,717,519 hectares, down just under two per cent from March 31, 1986.

In the year under review, eight prospecting permits covering 28,776 hectares and 57 leases covering 2,627 hectares were granted under The Quarrying Regulations, 1957. Three of the permits were for sand and gravel, and five were for one or more of limestone, clay and shale.

Forty-six of the leases were for one or more of sand, gravel, rock and clay, of which six were acquired by Saskatchewan Highways and Transportation, two by Saskatchewan Parks and Renewable Resources, 19 by rural and urban municipalities and 19 by private interests. Ten quarrying leases were granted for kaolin and one for clay. At year end, 77,451 hectares were held under 19 prospecting permits and 23,522 hectares were held under 1,092 quarrying leases.

One alkali mining lease was issued and one was surrendered, resulting in a total of 34 leases covering 10,408 hectares being held at the end of the year.

Forty new coal leases were issued and 29 were surrendered, resulting in a total of 588 leases

covering 99,308 hectares being held at the end of the year. Three coal exploration permits covering 1,004 hectares were also issued.

Five new subsurface mineral permits covering 130,822 hectares in the Lanigan and Quill Lakes areas were issued during the year, giving a total of six permits covering 145,972 hectares at the end of the year. Two leases were increased in size, resulting in a total of nine leases covering 194,736 hectares at the end of the year.

Mining Operations Section

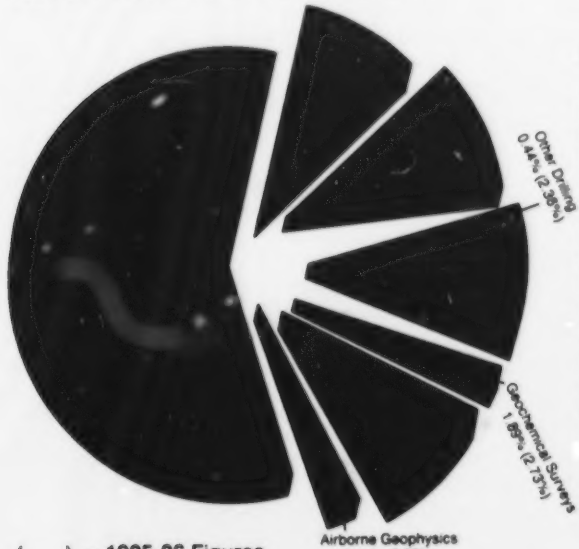
The Mining Operations Section is responsible for administration of those sections of The Mineral Disposition Regulations, 1986 governing the conduct and reporting of mineral exploration work programs, and for monitoring mining activity.

Exploration Unit

The unit is responsible for evaluating technical data submitted as assessment work by the mineral industry under The Mineral Disposition Regulations, 1986.

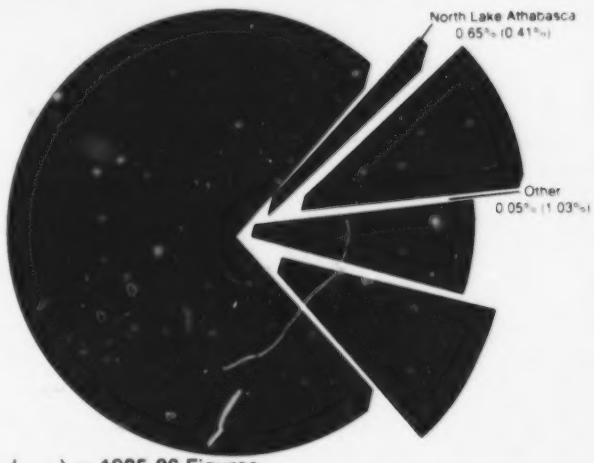
Assessment work received during a fiscal year gives an indication of major trends in the level of mineral exploration activity and the geographic areas in which such activity has taken place, although it does not provide a true measure of total exploration expenditures. A total of 1,698 submissions covering ten categories of exploration work were received, up about 80 per cent from the previous year. Exploration expenditures claimed were up 226 per cent from 1985-86 ($42.8 million vs. $13.1 million, vs. $30.3 million in 1984-85). Approximately 58 per cent of the total reported expenditure was for diamond-drilling (Figure 6), and approximately 73 per cent was associated with the search for uranium in the Athabasca Basin (Figure 7).

Figure 6
1986-87 Assessment Credits by Activity



( ) = 1985-86 Figures

Figure 7
1986-87 Assessment Credits by Region



( ) = 1985-86 Figures

Engineering Unit

The major functions of the unit are to:

- monitor development and mining operations pertaining to those minerals for which the branch has reposnsibility;
- collect, process and maintain records and disseminate data related to mineral production;
- co-ordinate department response to project proposals referred by Saskatchewan Environment as part of the environmental impact assessment process, and specifically to evaluate those proposals pertaining to mining developments; and
- provide technical expertise and assistance to other branches and divisions in the department.

Data on amounts and values of mineral output were collected from 29 individual mining operations, and information was supplied to seven government departments and agencies and 16 mining companies.

During the year, 19 project proposals and Environment Impact Statements were reviewed by the department, seven of which dealt specifically with mining operations.

Technical expertise in the unit was used to provide consultative services with respect to submissions under Potash Resource Payment Agreements, evaluate the status of research and development projects related to potash, and provide information related to mining operations in response to requests from within and outside the department.

Unit staff represented the department at the annual meeting of a Federal-Provincial Committee on Mineral Statistics.

Petroleum and Natural Gas Division

Bruce Wilson
Executive Director

The Petroleum and Natural Gas Division has major responsibilities in all areas related to provincial jurisdiction over oil and gas resources including disposition and management of Crown oil and gas rights; well licensing and surveillance of all exploration, development and production operations; oil and gas conservation including determination of reserves and producibility estimates; maintenance of production and disposition statistics; crude oil marketing; and royalty and tax legislation.

The responsibilities of the division are carried out through the operation of five banches:

- Geology and Petroleum Lands
- Engineering Services
- Economic and Fiscal Analysis
- Petroleum Development
- Petroleum Statistics

The past year will be remembered as one of the most difficult and challenging years in the history of Saskatchewan's oil and gas industry. Without question, the oil price collapse of early 1986 was the most significant factor influencing the state of the oil industry here and elsewhere in Canada. Provincial fiscal policies for oil were reviewed and amended in response to this situation. On the natural gas side, deregulation initiatives both nationally and provincially dominated efforts of those people in the department responsible for this resource.

The drop in oil prices had a devastating impact on the health of the Saskatchewan oil industry and the overall economy of the province. Because of depressed economic conditions, many low productivity wells became uneconomic to produce, well servicing work was reduced and drilling activity fell sharply from the record setting level of l985. Approximately 5000 direct and indirect oil related jobs were lost in the province, land sale revenues for 1986/87 fell to $12.3 million from the previous year's amount of $122.7 million and royalties and taxes to the province were reduced by more than 50 per cent from the previous fiscal year.

In order to maintain oilfield investment, employment and provincial oil revenues, both temporary and longer term changes were made to the province's fiscal regime for oil. A temporary program of royalty/tax adjustments and well servicing incentives was introduced effective May 1, 1986 for a six month period. On January 1, 1987 the province introduced a longer term response to the problem of low and unstable oil prices which included a price sensitive royalty/tax system, temporary enhancements to drilling incentives, and special relief for marginal wells producing below 10 barrels of oil per day. These initiatives, combined with the removal of PGRT by the federal government in October of 1986, were successful in maintaining the majority of wells on production and encouraging modest levels of activity.

Crude oil markets remained relatively strong throughout the year with production averaging 90 per cent of capacity or better. Continuing work on expansions to the Interprovincial Pipe Line system limited problems due to pipeline space.

Although the oil industry experienced a general downturn in 1986/87, two positive events of note did occur. Construction of the 50,000 barrel per day NewGrade heavy oil upgrader in Regina began in earnest in late 1986. Once operational in late 1988, the upgrader will provide a secure and stable market for a significant amount of Saskatchewan's heavy oil production. Saskatchewan's policy to encourage deep oil drilling also paid dividends as at least two major deep Devonian discoveries were made in the southeast area of the province. These successes are expected to generate considerable interest and activity in the future.

In keeping with natural gas deregulation initiatives elsewhere in Canada, Saskatchewan announced the first of a two-phased deregulation plan in February, 1987. Effective January 1, 1987 regulated prices were rescinded and replaced with a system which will enable buyers and sellers to negotiate prices in an unfettered manner. Similar to the changes made for oil, a new price sensitive royalty/tax system was implemented for natural gas. The second phase of deregulation dealing with direct gas sales within the province and policies related to natural gas exports was to be implemented later in 1987.

Petroleum Development Branch

The Petroleum Development Branch is responsible for ensuring that the field operations of the province's oil and gas industry meet acceptable technical and environmental protection standards and that well licensing proceeds in accordance with regulations established under The Oil and Gas Conservation Act.

The Regina staff:

- directs field office operations;
- processes and approves applications for well drilling licenses;
- enters initial data for the Well Information System;
- maintains records and control of well deposits made to guarantee proper drilling, completion and abandonment of wells;
- processes and approves well ownership and name changes;
- advises of offset drilling commitments on Crown land;
- processes weekly drilling reports and compiles statistical data relating to drilling activity; and
- represents the department on oil spill co-operatives.

The field office staff:

- collects and compiles drilling, completion and reservoir data;
- enforces regulations, orders and policies pertaining to pollution control in the oil and gas industry;

- checks standards, procedures and equipment used by industry in drilling, producing and abandonment of wells;
- witnesses production tests;
- performs on-site inspections of all wells and facilities;
- investigates and assists in resolving landowner problems associated with the use of land for geophysical activity, exploration and production; and
- investigates, reports and ensures that industry act promptly and efficiently in handling oil and salt water spills.

The Well Information System has continued to be updated and expanded. This computerized system has proven effective in handling well information from time of licencing through to abandonment. In addition to licencing and entering drilling information into this sytem, staff also registered and recorded 1,205 well ownership changes and 434 well name changes.

Offset commitments were called to 330 undrilled Crown leases as a result of new freehold producing wells. Staff continued to handle large numbers of inquiries pertaining to drainage units, target areas and the requirements necessary in drilling, production and abandonment work. During the year field staff carried-out 1,223 pressure maintenance/water disposal well checks, 41 land owner related complaints, 596 production test audits, and reported on all of the activity associated with the drilling, completion and abandonment operations undertaken by the province's oil and gas industry.

Environmental surveillance continued in all of the province's oil producing pools. Nearly 42,000 well, battery and rig inspections were carried out, clean-up was monitored on 582 oil/salt water spills (this number is a reduction from the 634 reported spills in 1985 and represents .02% of the total oil produced) and 300 drilling mud pits were checked to ensure proper pH and chloride levels.

The Saskatchewan Research Council was retained to continue the drilling mud disposal research program. Growth chamber studies and on site inspections were carried out to further evaluate the present disposal guidelines.

Drilling Activity

Drilling activity in 1986 took a sharp decline compared with the previous 1985 record drilling year. The decline can be directly attributed to the sudden downturn of oil prices which occurred at the end of 1985.

In 1986 there were 1,079 oil, gas and service wells drilled. A breakdown of this activity follows: 659 completed oil wells, 233 completed gas wells, 28 completed service wells and 159 abandoned dry holes resulting in an overall success ratio of 85 per cent. There were 1,072 drilling licenses processed and issued compared to 3,971 for the 1985 calendar year.

Figure 8
Wells Drilled by Area

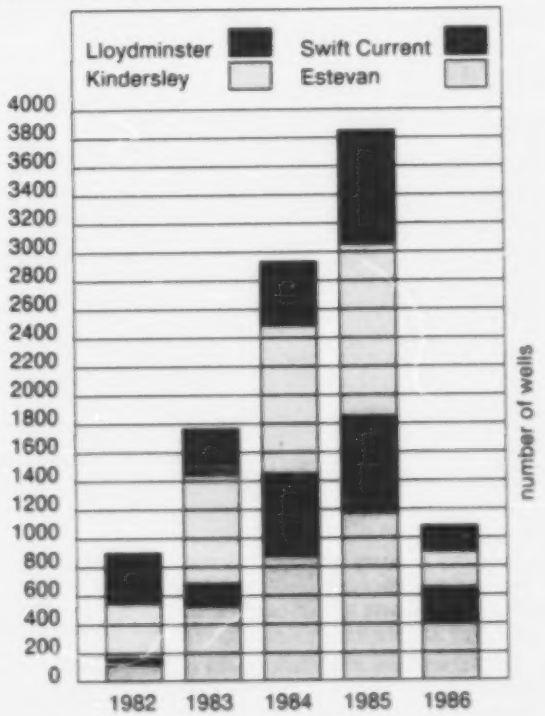
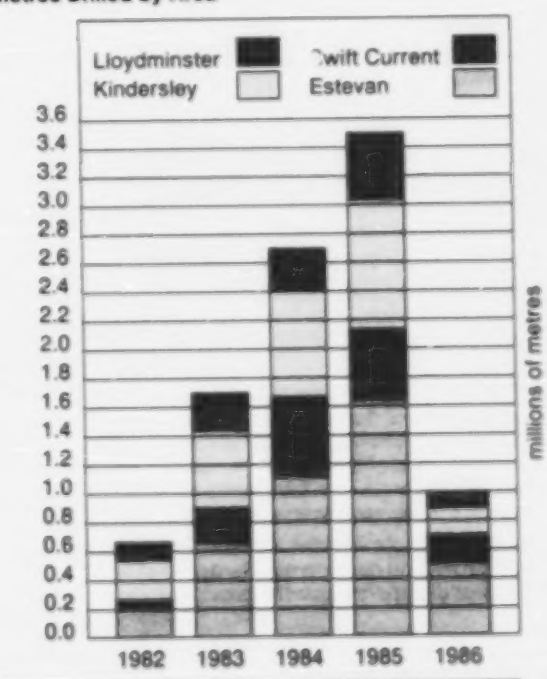


Figure 9
Metres Drilled by Area



Engineering Services Branch

The Engineering Services Branch evaluates Saskatchewan's crude oil and natural gas reservoirs to ensure that exploration, development and production of these resources follow good conservation and engineering standards. Sound management of these resources is essential to achieve efficient production and ensure maximum benefits from development. The mandate for these responsibilities comes from The Oil and Gas Conservation Act, The Crown Minerals Act, The Pipe Lines Act and respective regulations.

Specifically this branch:

- determines crude oil and natural gas reserves for use by industry and government in planning and developing policies;
- evaluates industry applications for enhanced oil recovery projects, waste water disposal wells, off-target wells and other proposals and participates in public inquiries held to consider these applications;
- assesses unitization proposals to ensure that Crown lands receive fair and equitable unit participation;
- evaluates industry submissions for incremental oil production from waterflood and enhanced oil recovery projects to establish reduction to Crown royalties and freehold production taxes;
- establishes pool boundaries, well spacing and target areas to facilitate orderly crude oil and natural gas development;
- issues maximum permissive production rates for oil wells and daily allowables for gas wells, and monitors production to ensure that these rates are not exceeded;
- issues construction and operating permits for oil and natural gas pipelines and witnesses pressure tests conducted to ensure that pipelines meet operating standards;
- prepares for publication, pertinent engineering, development and production data for oil and natural gas pools, including monthly demand for Saskatchewan crude oil;
- monitors crude oil markets and tabulates nominations for crude oil; and
- provides technical expertise and assistance to other branches and divisions in the department.

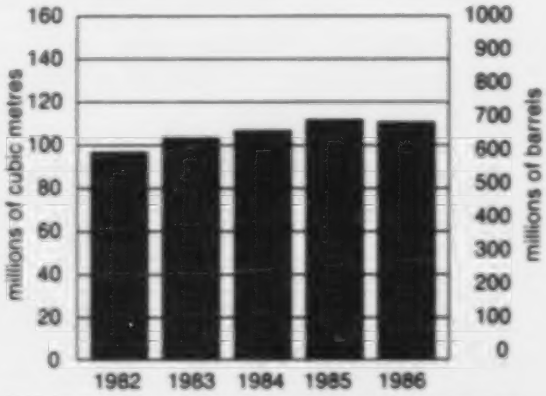
Highlights

- The highlight of the year was the significant discovery of Winnipegosis formation oil in the Tableland area of Southeast Saskatchewan. This discovery prompted an immediate increase in seismic activity, land leasing and deep drilling.
- Another highlight was the increase in natural gas exploration and development largely due to the approval of exports from the province.

Crude Oil Reserves

- Saskatchewan's remaining established crude oil reserves were increased by an estimated 10.985 million cubic metres to 111.290 million cubic metres in 1986. This is the net result of an increase in initial reserves of 22.606 million cubic metres less production of 11.621. These reserve increases are largely attributed to the re-evaluation of exploratory and development drilling activity in 1985.
- The department estimates that the potential enhanced oil recovery reserves are 667 million cubic metres with 89 per cent of these reserves classified as heavy oil.
- These potential reserves are an indication of the oil that can be recovered assuming that enhanced oil recovery techniques are successfully applied. Considerable technical risk currently exists requiring further research and experimentation.

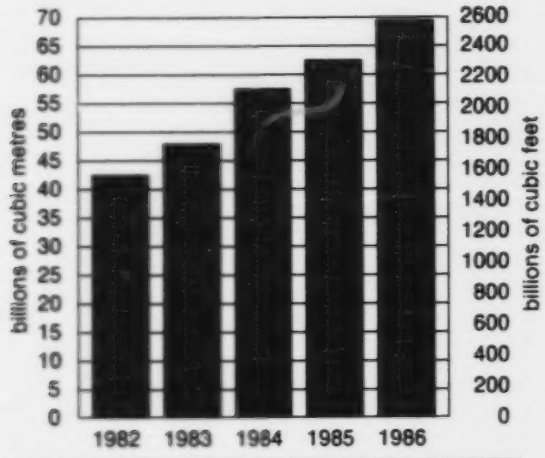
Figure 10
Remaining Oil Reserves



Natural Gas Reserves

- Saskatchewan's remaining established natural gas reserves were increased by an estimated 6.43 billion cubic metres to 69.69 billion cubic metres in 1986. This is the net result of an increase in initial reserves of 8.70 billion cubic metres less production for sales of 2.28 billion cubic metres.
- The department estimates that the remaining ultimate potential which includes established reserves could reach 161 billion cubic metres. Additional exploration and development is required for better evaluation.

Figure 11
Remaining Gas Reserves



Crude Oil Production

- Oil production in 1986 was 11.7 million cubic metres compared to 11.6 million cubic metres in the previous year. This slight increase was the result of continued strong markets for Saskatchewan's crude oil and the drilling activity in late 1985. On average, there was minimal shut-in of production due to marketing difficulties and pipeline capacity in 1986.
- Saskatchewan's oil production is made up of different qualities of crude commonly identified as light, medium and heavy found in different geological zones and geographical areas. In 1986, approximately 32.0 per cent was heavy oil, 32.7 per cent was medium and 35.3 per cent was light.

Figure 12
Crude Oil Production

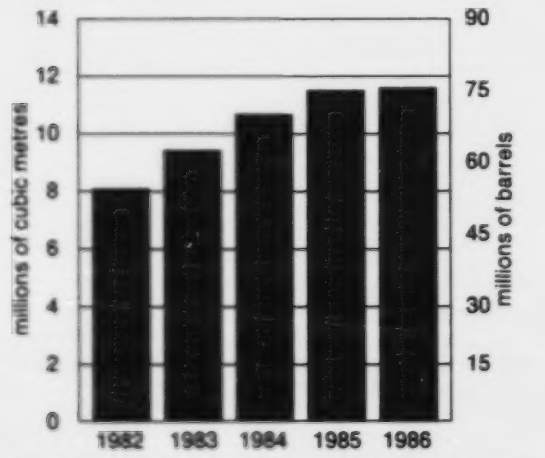
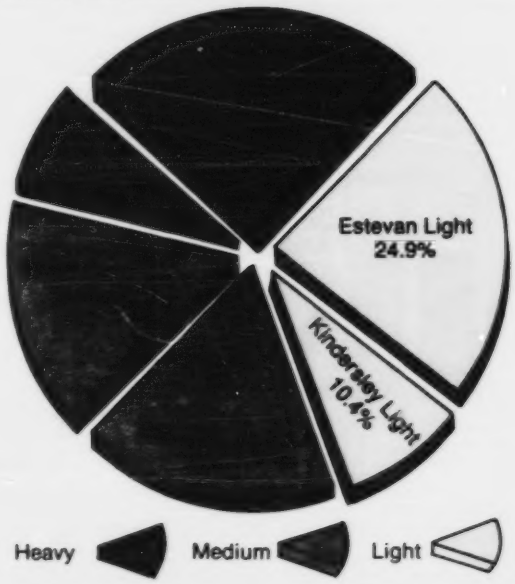


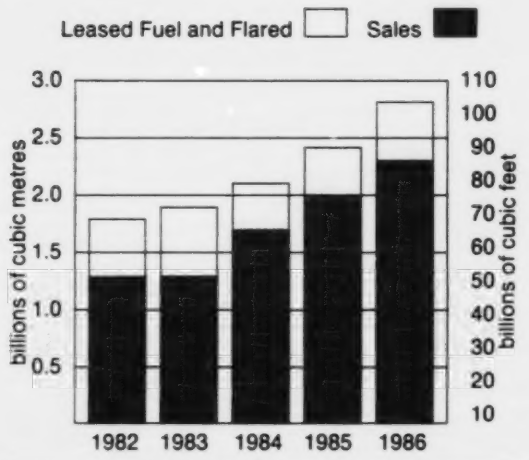
Figure 13
Quality of Saskatchewan Crude Oil Production by Area for Calendar Year 1986



Natural Gas Production

Natural gas production in 1986 was 2.75 billion cubic metres, an increase of 14.5 per cent from the previous year when it was 2.40 billion cubic metres. Sales of the province's natural gas were 2.28 billion cubic metres with the remainder of the production used for lease fuel or flared. Approximately 0.28 billion cubic metres of natural gas were exported from the province in 1986 compared to imports of 1.08 billion cubic metres. Natural gas production will progressively increase because these imports will be reduced as the province strives for self-sufficiency. Import reduction will allow the province's shut-in reserves to be developed and produced. In addition, limited interruptable natural gas exports to eastern Canada which commenced in the first quarter of 1986 will further increase production in 1987.

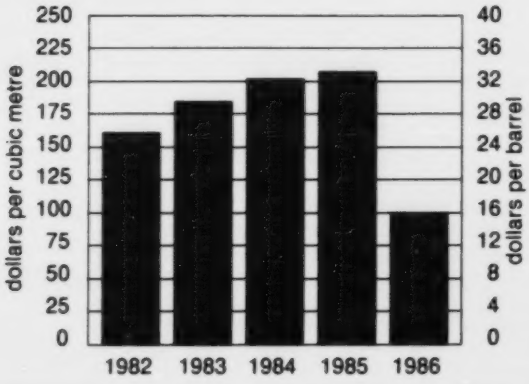
Figure 14
Natural Gas Production



Average Crude Oil Prices

The average 1986 Saskatchewan crude oil price of $99.00 per cubic metre represents a 52 per cent decrease over the $208.22 per cubic metre average for 1985. This dramatic drop in crude oil prices was due to the corresponding drop in world oil prices.

Figure 15
Average Crude Oil Prices



Geology and Petroleum Lands Branch

Geology Mapping and Land Evaluation Section

This section has two principal responsibilities: geological mapping and land evaluation.

Geological Mapping Unit

Geological maps (mainly structure contour maps) are drawn and maintained for all oil and gas producing areas in the province. The maps are used for land evaluation, for reserve calculations in the Engineering Services Branch, and in helping solve problems related to the producing areas. At the end of the fiscal year, 119 pool maps were being maintained. The maps may be purchased from the department's publications office.

In carrying our their mapping work geologists acquire a detailed knowledge of the geology of the producing oil and gas pools. This expertise is put to use within the Petroleum and Natural Gas Division when staff members are asked to make recommendations on submissions from industry or in dealing with other administrative matters.

Industry submissions in the reporting period included applications for pressure maintenance of producing units, conversion of wells to salt water injection and disposal, and secondary recovery of oil by waterflood. As well, requests were received for permission to drill wells outside the approved spacing pattern and for abnormal well spacing patterns.

information and advice were made available to other branches, departments and the general public on requests ranging from the interpretation of the economic geology of known oil and gas accumulations to the hydrocarbon potential of unexplored prospects.

Petroleum Lands Section

This section's responsibilities are twofold: disposition administration and registration.

Disposition Administration

This responsibility involves the administration and disposition of approximately 8.5 million acres of Crown mineral lands under The Petroleum and Natural Gas Regulations, 1969; The Helium and Associated Gases Regulations, 1964; The Oil Shale Regulations; The Mineral Resources Act, and The Oil and Gas Conservation Act.

The number of petroleum and natural gas permits under disposition decreased from 112 at April, 1986 to 109 at March 31, 1987 with a proportionate decrease in area from 726,262 hectares (1,794,633 acres) to 670,729 hectares (1,657,407 acres). Drilling reservations under disposition also decreased in the same period from 49 to 10 with a decrease in area from 67,068 hectares (165,728 acres) to 13,959 hectares (34,493 acres). Petroleum and natural gas leases in effect however increased from 9,738 leases at April, 1986 to 10,109 at March,

1987. Area under lease totalled 2,511,441 hectares (6,205,907 acres). Lands under helium leases remained at 9 with no change in area at 21,548 hectares (53,247 acres). One helium permit was in effect for an area of 30,108 hectares (74,400 acres). Oil shale permits also remained unchanged at 4 in an area of 161,166 hectares (398,250 acres) with one oil shale lease totalling 1,942 hectares (4,800 acres). A total of 11 gas storage agreements in an area of 39,106 hectares (96,633 acres) were in effect.

All expiring dispositions are reviewed annually to establish whether they will remain active for another year. A total of 4,700 dispositions were subject to review in March, 1987 which represents an increase of approximately 400 dispositions from April, 1986.

Registration

This responsibility involves the monitoring, recording and registering of transactions directly affecting all dispositions through transfers, amalgamations, encumbrances or securities.

A monthly average of 385 transactions occurred in 1987 which represents a decrease from the monthly average of 450 in the previous year. The number of transactions affecting dispositions at the end of March, 1987 totalled 4,536 with transfers having the highest recorded total of 589 in the month of May. Searches decreased from 4,800 at April, 1986 to 3080 at March, 1987. The monthly average for 1986/87 was 257. The highest recorded total for searches was 448 in the month of March, 1987.

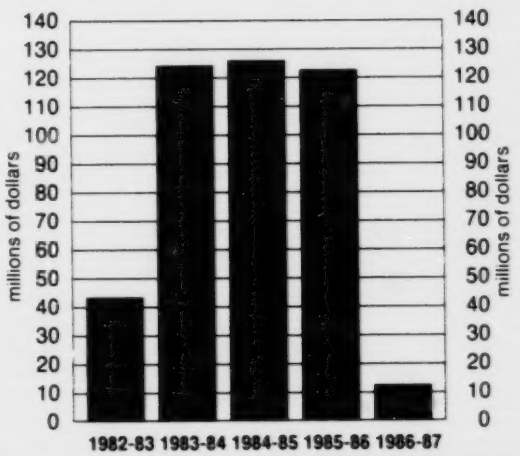
Land Evaluation Unit

The economic potential of hydrocarbon resources underlying specific areas of the province is determined as required by the department. Monetary evaluations of reserves are primarily for land sales. As well, this unit:

- reviews and recommends requests from industry for the posting of specific Crown mineral lands at department land sales;
- prepares sales notices and technical data for sales;
- reviews and recommends acceptance or rejection of bonus bids received from industry on posted lands;
- evaluates and selects Crown acreage in drilling reservations when such reservations go to lease;
- administers net royalty leases and inspects non-unit net royalty leases and farmouts to ensure compliance with the terms or agreements made within the department;
- reviews requests for waiver of offset well commitments on leases adjoining certain freehold lands producing oil or gas and makes follow-up recommendations;
- advises industry and the general public concerning the value of mineral rights for specific areas.

Four sales of Crown petroleum and natural gas rights were held during the 1986-87 fiscal year. Revenues totalled $12,344,308.22. Dispositions of mineral rights in the 1986-87 fiscal year totalled 128,056 hectares (316,434 acres) consisting of 16 permits containing 58,341 hectares (144,164 acres), 8 drilling reservations comprising 9,649 hectares (23,842 acres), and 428 leases consisting of 60,067 hectares (148,428 acres). Revenue from the sale of petroleum and natural gas rights for the past five years is shown in Figure 16.

Figure 16
Revenue from Sales of Crown Petroleum and Natural Gas Rights



Economic and Fiscal Analysis Branch

The Economic and Fiscal Analysis Branch evaluates, designs and implements oil and gas Crown royalty and freehold tax systems and exploration/development incentive systems to maximize provincial revenues while maintaining an active oil and gas industry. In addition, the branch provides production, revenue, expenditure and employment forecasts related to Saskatchewan's oil and gas fields.

Functionally, the branch is divided into the Royalty/Tax Analysis Section and the Incentive Administration Section.

Royalty/Tax Analysis Section

This section analyses, designs and amends the crude oil and gas Crown royalty and freehold tax regimes cited within The Petroleum and Natural Gas Regulations, 1969 and The Freehold Oil and Gas Production Tax Regulations, 1983. The production, revenue and employment forecasts for internal and external uses are also prepared by this section.

More specifically, this section:

- evaluates the economics of crude oil and gas exploration, development and production under varying federal and provincial fiscal arrangements;

- analyses, develops and proposes royalty and tax incentives to encourage implementation of enhanced oil recovery schemes, (e.g. waterfloods, steamfloods, carbon dioxide floods);
- monitors and forecasts crude oil prices, gross oil revenues, provincial revenues, oil production and related oil expenditures and employment;
- analyses the impact of changes, (e.g. prices, federal taxation) that affect oil and gas activity in the province and surrounding jurisdictions;
- provides analytical assistance pertaining to upgrader negotiations and consumer gasoline inquiries;
- monitors revenue sharing between governments and industry;
- prepares submissions to boards and commissions on future crude oil supplies;
- prepares information circulars, directives and notices to keep industry informed of changes; and
- performs the necessary consultation process with industry regarding policy changes.

Due to the dramatic drop in oil prices in 1986, the Economic and Fiscal Analysis Branch devoted much of its time to assessing the impacts of the price drop on Saskatchewan's oil industry and developing appropriate responses to the situation. Both existing production and new drilling activity were noticeably affected by the new pricing environment.

A temporary oilfield program was introduced on May 1, 1986 to maintain wells on production and to encourage continued maintenance of wells. Certain royalty/tax reductions and workover incentives were implemented for a period of six months. During this time the department was able to more fully analyse the nature and extent of the problem, consult with industry and develop a longer term response. It is estimated that up to 5,000 direct and indirect jobs and 6,000 producing wells were maintained under the temporary program.

A longer term response to the drop in prices was announced on December 23, 1986 and made effective January 1, 1987. The changes announced included:

1) The introduction of price sensitive royalty/tax systems to maintain the operation of wells under low oil prices. As prices move up or down the royalty/tax rates are adjusted accordingly.
2) The enhancement of development drilling and waterflood incentives for a temporary period of time to maintain reasonable levels of activity under lower oil prices. Three year royalty/tax holidays are in place for the period January 1, 1987 to June 30, 1988, two year holidays for the period July 1, 1988 to June 30, 1989 and the one year holiday will apply thereafter unless prices remain below $20 U.S. per barrel.
3) The introduction of special royalty/tax relief for marginal wells to prevent these wells from being suspended or abandoned. A one per cent royalty rate and zero tax rate applies to wells producing less than approximately five barrels of oil per day.

Early signs indicate that the industry has responded positively to the changes. Land sale interest and drilling interest have increased substantially from 1986 levels.

The importance of enhanced oil recovery (EOR) developments in the province was supported with new government initiatives announced in 1986. In order to improve the economics of implementing and operating these expensive EOR projects, a revision was made to the cost sensitive provisions of the royalty/tax structure to provide relief to the more marginal projects and a new policy was approved allowing EOR projects to purchase natural gas directly from local producers.

On the natural gas side, the branch was involved in the development of marketing and revenue policy changes related to the deregulation of the natural gas industry in the province. The branch designed a new price, productivity and vintage sensitive royalty system compatible with a system of market-determined prices and similarly a new tax system for freehold natural gas production. These systems were announced in February, 1987.

During the year the branch also prepared a number of economic and financial forecasts for internal and/or external government use.

Incentive Administration Section

The Incentive Administration Section is responsible for the development, analysis and administration of incentive programs offered by the province to promote increased activity. The section closely monitors the cost effectiveness of these incentive programs to ensure maximum return for the province's incentive dollar as well as maintain a positive climate for development and exploration in the province.

This section reviews all requests related to the administration of the oil royalty/tax holiday program. Under the program in 1986, non-deep wells qualified for a one or three year holiday and deep wells qualified for a three or five year holiday. Similarly, incremental production from a new or expanded waterflood project was eligible for a one year holiday.

In 1986, 687 oil wells were completed for production of which 643 wells were non-deep development wells eligible for a one year holiday, 12 wells were non-deep exploratory wells eligible for a three year holiday, 1 well was a deep development well eligible for a three year holiday and 2 wells were deep exploratory wells eligible for a five year holiday. The remaining completed wells did not receive the holiday incentive.

As part of the temporary oilfield program put in place for six months in 1986, a program called the Service and Supply Employment Program (SSEP) was introduced. This program provided royalty/tax credits equal to 40 per cent of the eligible service, repair and maintenance expense incurred during the six month period. Over 170 operators took part in this program entailing the filing and processing of

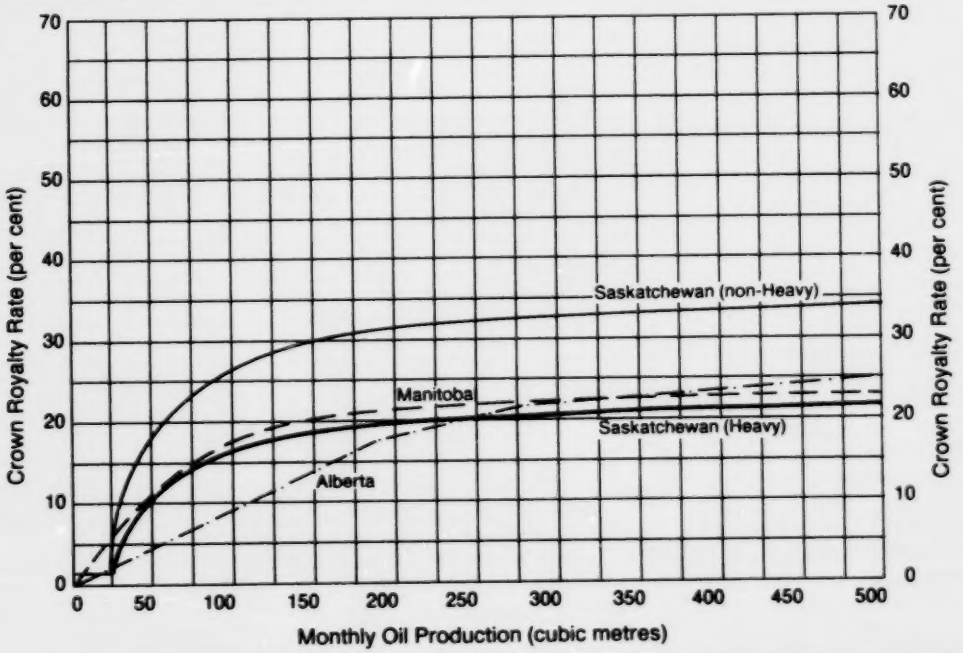
many credit applications. The program was limited to a total provincial royalty/tax credit of $12 million.

Economic and technical evaluations were carried out under the Workover Incentive Program. Under this program the department may approve the reclassification of old oil production to new oil for royalty/tax purposes. Approval requires submission of a work program designed to maintain and improve production from old oil wells or units. An estimated 7 million dollars was spent by industry under this program in 1986.

The Incentive Administration Section also performs the following duties:

- monitors and forecasts exploration and development expenditures;
- monitors and forecasts operating costs associated with the production of crude oil;
- determines the initial holiday status of wells as noted on the "Application for Licence to Drill a Well";
- reviews and makes recommendations in regard to holiday extensions due to marketing restrictions or other exceptional circumstances;
- evaluates and analyses the exploration, development and production incentive systems of the federal government and other provincial provinces;
- prepares information letters;
- conducts economic and engineering analyses on special problem issues, wells and projects;
- develops and maintains computerized well information programs to enable the duties of this branch and other branches to be more accurately performed.

Figure 17
Conventional Crude Oil Royalty Curves for New Developments March, 1987



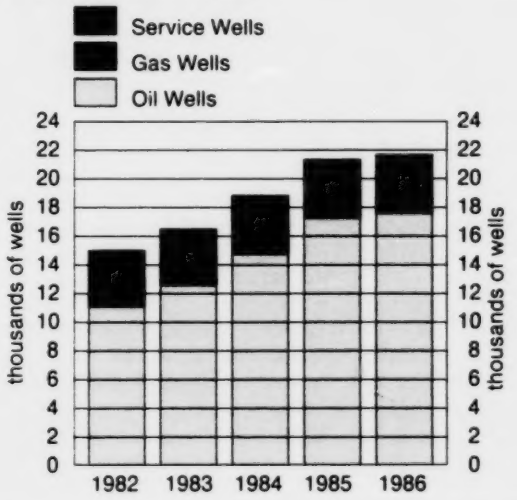
Petroleum Statistics Branch

The Petroleum Statistics Branch is responsible for the collection, processing and management of statistical data on the production and disposition of petroleum resources in the province in accordance with the regulatory requirements of The Oil and Gas Conservation Act and regulations thereunder, for the maintenance and efficient operation of computerized data processing and storage systems, for the administration of the Production Monitoring/Testing/Auditing Program, for monitoring and evaluation of wellhead oil and gas prices and transportation costs, and for providing statistical services to both internal and external users.

In particular, the branch

- collects, validates, processes and records statistical data on the production and disposition of crude oil, natural gas, water and other products associated with oil and gas field operation;
- maintains, develops and implements appropriate modifications and enhancements to existing computer systems as well as designs and develops new systems to meet new policy initiatives;
- participates in a joint review process with other western producing provinces and industry task force committees on the development and standardization of all industry reporting forms, procedures and requirements;
- administers and co-ordinates activities of the Production Monitoring/Testing/Auditing Program to ensure proper and accurate measurement and allocation of production among wells tied to a common producing facility with primary emphasis on wells receiving royalty/tax incentives;
- reviews, establishes and informs industry of the appropriate royalty/tax status and length and commencement date of incentive period of new wells/units as well as maintains and updates the status of existing wells/units;
- monitors, analyses and evaluates posted terminal prices and reported wellhead prices of Saskatchewan crude oil and natural gas and the delivered price of that oil and gas to specific markets;
- monitors and investigates oil and gas production and disposition reporting practices to ensure compliance and to provide assistance and interpretation to industry with regulatory requirements;
- reviews, analyses and evaluates pipeline tariffs and trucking costs and its economic impact on provincial royalty/tax revenues;
- monitors, researches and compiles statistical information pertaining to the marketing of Saskatchewan crude oil and natural gas production;
- monitors, assesses and establishes the quality of Saskatchewan crude oil production on an individual well, battery and pool basis;
- prepares for publication various weekly, monthly and yearly statistical reports on the production and disposition of petroleum and mineral resources;
- provides statistical services to petroleum industry, federal and provincial government bodies, consulting firms, universities and the general public.

Figure 18
Wells Capable of Production



Although drilling activity during the past year was down significantly from the all-time record established in 1985 due to a dramatic 60 per cent drop in the price of oil that began to decline at the start of 1986, another 1,015 wells were brought on production, increasing the number of wells contributing to provincial oil and gas production to 21,992 with reports submitted on a monthly basis by 325 operators.

Given the vital role of an accurate and relevant statistical data base in a dynamic oil and gas industry, the automated system which records, validates and stores production, injection and disposition data from a large number of oil, gas and service wells must be able to respond to a broad range of reporting and user requirements. As a result of the increase over the past several years in the number of changes to administrative and reporting requirements, the demand for additional information, and the volume of information that must be collected, considerable effort was spent on the development of standardized reporting formats, procedures and requirements with other western producing provinces and various industry associations. Significant progress has been achieved with only a few minor issues remaining to be resolved by fiscal yearend. With standardization

near completion, work is also underway to develop a new automated system capable of handling an increased workload and the more complex reporting requirements as dictated by changing conditions. The new system will eventually replace the existing system which was developed in the late 1960's.

The branch also continued its role in the administration and co-ordination of the Production Monitoring/Testing/Auditing program which involves activity in several branches in the department. This program was established to ensure accurate and proper measurement, allocation and reporting of crude oil produced from each and every well in the province. A proposal together with several computer programs was developed to facilitate the monitoring and testing aspects of the program. During the year, field staff have conducted production testing on a large number of wells with results being analysed manually by Regina staff. Comprehensive monitoring and in-depth analysis will begin upon completion of the required system development and modification work which has been identified and documented. Through meetings and seminars, close contact was maintained with other producing provinces, particularly Alberta on matters that are of mutual concern.

With the announcement of a major new natural gas deregulation policy in February 1987, branch staff spent a considerable amount of time in providing input on the administrative feasibility of various options under review and in assessing the impact of gas deregulation on reporting forms, procedures and requirements and on existing automated systems. Work is continuing with significant progress being achieved in all areas.